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FACTORS AFFECTING SELF-EVALUATED GENERAL HEALTH STATUS - AND THE USE OF PROFESSIONAL HEALTH CARE SERVICES.

by
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And not to forget Pippin .....

Tromsø, September 1991

Knut Fylkesnes

LIST OF PAPERS

I. Fylkesnes K, Førde OH. The Tromsø-study: Predictors of self-evaluated health - Has society adopted the expanded health concept? Soc Sci Med 1991; 32: 141-6.

II. Fylkesnes K, Førde OH. Determinants and dimensions involved in self-evaluation of health.
Soc Sci Med 1992; 35: 271-79.

III. Fylkesnes K, Johnsen R, Førde OH. Factors affecting patient-initiated and physician-initiated use of health care services.
Sociology of Health & Illness 1992; 14: 275-92.

IV. Fylkesnes K. Determinants of health care utilization. Visits and referrals.
Scand J Soc Med 1993; 21: 40-50.

V. Fylkesnes K. Health status and general practitioner visits.

INTRODUCTION

> "Pippin was healthy in so far as he knew. By this I mean his health was so good that he was not aware he had it."
> (John Steinbeck in "The short reign of Pippin IV")

The idea of health has been given different meanings throughout history. The "Pippin perspective" introduced here contrasts the seemingly prevailing cultural climate of fascination and concern with personal health, uneasiness and "elevating health to a super value, a metaphor for all that is good in life" (1). What Pippin might help to illustrate is the reported historical trend toward a broadening of the range of problems and social phenomena being conceptualized in terms of health and illness (1-4). To the primary health care system, involved with the care of illness experience - although accused for being basically centred on disease - such changes have obvious strong implications.

The main topics of the present analyses are the exploration of factors involved in health and illness perceptions and the use of health care services. The first challenge when trying to face these topics is the conceptual approach.

Concepts of health, illness and disease

A wide variety of frames of reference can be employed when trying to define health, and conceptions are assumed to be in constant process of adaptation or revision. At the foundation of the World Health Organization (WHO) health was defined as "a state of complete physical, mental and social well-being, and not merely the absence of disease and infirmity". This definition is first of all seen as a programmatic definition, originated as a reaction to the first half of this century's medical tradition characterized by a strictly disease oriented conceptualization of health and the "engineering approach to medicine". This more comprehensive approach, often called "social", was confirmed in the Alma-Ata declaration of 1978 (5) and has obviously, both inside and outside medicine, had important influence. To day health is widely accepted as a multidimensional concept, seen both conceptually and operationally as composed of distinct dimensions (6-7).

Among the various theoretical approaches and the numerous definitional suggestions in terms of health, the contribution made by Parsons (8) represents an alternative and supplementary perspective to those being strictly biomedical. He conceptualizes health in reference to social status and role structure and social control: "The institutionalization of expectations relative to role and to task performance is fundamental in all human societies. There must, therefore, always be standards of "adequacy" of such performance and of

the "capacities" underlying it which must be taken into account, and hence a corresponding set of distinctions between states of individuals which are and are not "satisfactory" from the point of view of these standards" (8, p. 63). Parsons suggests that health might be seen

> "as the state of optimum capacity of an individual for the effective performance of the roles and tasks for which he has been socialized" (8, p. 69).

Thus health is concerned with capacity, and the reference is made to the individual's participation in social systems, to the location in the system ("status" as the positional aspect) and the role (and task) performance (as the processual aspect). Capacity expresses both abilities and opportunities related to role expectations. Status is here seen as a social label or position "referring to major categories for differentiating members of society, .. and define to some extent how he is expected to behave and how others should behave toward him" (rights and duties) (9). Role refers to "the enactment of rights and duties attached to a given status" (10). According to Parsons, the mechanisms of social control (the institutionalization of the sick role) are both positive and negative. The negative is seen through the insulation of the sick to inhibit the spread of certain types of deviance. The positive when actions are taken putting the sick in the position of receiving help or treatment.

With reference to Parsons, illness is seen as a form of deviant behaviour. The individual fails to confirm to own or others' expectations. As suggested by Twaddle (11), this "capacity" perspective may primarily be applicable to modern western societies, but with varying applicability to different groups.

An important distinction should be made between the patients' views of sickness as illness contrary to the biomedical views of sickness as disease (12-13). Disease refers to pathological processes and is "the problem" seen from a medical or the practitioner's perspective. On the contrary, illness represents the human experience of symptoms, distress and suffering. It refers to the way the person and his/her network (significant others) perceive and respond to symptoms and disability, and the person's judgement of how to cope (13).

The measurement problem

In the literature the term "health status" (status in this context not to be mixed with status as a unit of social systems) has been given different meanings. The present approach makes reference to the illness-disease distinction, implicating that clear distinctions should be made between "perceptional" aspects (integrating physical, mental and social dimensions), diseases (medical diagnoses) and

physiologic dimensions (for instance blood pressure, serum cholesterol level). The term health status, as used in the present study, refer to the perceptional aspects.

How are we to measure health status?. In his review of concepts and health status measures, Ware (6) concludes that, despite many interesting developments in the past few decades concerning methods of measurement, the need and the potential for further progress are great. The divergent conceptualizations of the various dimensions of health status still seem to represent an important problem in health status measurements (6-7, 9). How to operationalize health status thus appears as one of the critical challenges.

Self-evaluation of general health

A measure of overall subjective judgement of health status has been suggested to be included as a particular dimension in measuring health status (6). In this regard self-rated health, a single item measure based on "How would you evaluate your own overall health (poor, fair, good, excellent)?, has been widely used. This is a rating not focusing on specific health dimensions. It is reported to be a reliable measure, and to reflect personal evaluations not captured by other measures (6). The suggestion is that self-evaluated health represents a summary statement of how various aspects of health are perceived within the framework of the individual,

and that people experience symptoms and different health threats in a more global manner than traditional medical conceptions would suggest (14).

The literature presents various arguments indicating the utility of a solid understanding of factors and processes shaping the way people come to evaluate own health:

- The individual's evaluation has been found to show a substantial stability through time, and to be a better predictor of physicians' future ratings than the reverse (15, 16)
- The consistent finding of self-rated health to be one of the best predictors of use of health care services (6, 15, 17-20).
- Several studies have revealed self-rated health to be an independent predictor of survival (16, 21-23).
- Findings seems to suggest self-rated health to be an important intervening variable between objective health problems and life satisfaction (24-25)

Health, illness behaviour and the health care system

Health and illness related behaviour shows a wide range of variation from one culture to another, indicating that these are largely learned differences (26). According to Mechanic (27) the concept of illness behaviour

> "describes the ways in which people respond to bodily indications and the conditions under which they come to view them as abnormal. Illness behaviour thus involves the manner in which individuals monitor their bodies, define and interpret their symptoms, take remedial action, and utilize sources of help as well as the more formal health care system. It also is concerned with how people monitor and respond to symptoms and symptom change over the course of an illness and how this affects behaviour, remedial actions taken, and response to treatment".

Illness behaviour thus represents a complex sorting process dependent on a variety of factors other than the amount and severity of illness. Mechanic (28, pp. 260-61) suggests two general (and supplementary) perspectives when trying to penetrate different patterns of illness behaviour. First, the behavioral patterns "may be seen as a product of social and cultural conditioning, because they may be experienced and enacted naturally in the social contexts within which they appear relevant". Second, illness behaviour patterns are seen "as part of a larger coping process in which illness behaviour is only one aspect of a coping process, an attempt to make an unstable, challenging situation more manageable for the person who is encountering difficulty". "Coping" is here seen as "the actions that people take on their own behalf as they attempt to avoid or lessen the impact of life problems" (29). Further, that people who "interact with each other and who

share important life circumstances will also share coping behaviours". Parsons' (8) theory of the sick role, containing central elements of rights (ie. to be exempted from normal obligations, the sick not to be held responsible) and obligations (ie. to get well, to seek help), might be seen as an example of a kind of coping model. Parsons' intention was to describe expectations attached to illness at the society level (the macro-level). The concept of illness behaviour, as formulated by Mechanic, however, puts the theoretical domain from the macro level to smaller units of analysis (11).

In the literature the term illness behaviour has been given different meanings. In particular those researchers working from a "social-psychological" framework (30-31) use the term "health-related behaviour". By this they try to make distinctions between what is strictly preventive health behaviour, illness behaviour (defined as actions after symptoms are experienced), and sick role behaviour (after diagnosis) (32). Within this framework (social-psychological) the "health belief model" appears as the one most extensively used. This model was originated to predict preventative health behaviour (for ref. see 30 and 33), but has later been used on various types of health related behaviour. Various social-psychological theories relate beliefs, values, attitudes to behaviour. The suggestion that "generalized expectancy" plays an important role in health related behaviour, in particular the one termed "health locus of control (HLC)" (31), seems to have received much attention by

researchers. Three dimensions have been conceptualized and operationalized: the internal HLC (one's health is controllable), external HLC (health is controlled by powerful others) and chance HLC (health seen as random events). The assumption is that "generalized expectancy" measured by the HLC constructs represents a possibility to separate beliefs that either facilitate or hinder particular health related actions.

Elliot Freidson's postulate that social networks, as resources available for lay consultation or lay referral, plays a crucial role in the handling of illness (34). This brings forward the question of where illness is dealt with in the society. When asked to draw a map of "the health care system" in society, most health professionals would probably exclude segments or components other than those strictly biomedical. Kleinman suggests a much broader health care system, based on cross-cultural comparisons of the way health and health care related aspects of society are culturally constituted and expressed. His elaborated concept of Health Care System (35) contains three distinctive and overlapping arenas of health and health care related aspects of society: The Popular, the Folk and the Professional sectors (Figure 1). The Popular Sector includes "activities" of the individuals, their family, social networks, and communities. We might talk about a "popular health culture" that represents the shared meanings of health and illness within social or cultural groups. Families and social networks represent the major social

contexts where individuals define and interpret their symptoms, where treatment is first applied and where utilization of either professional (the modern scientific medicine with distinctive health professions) and folk services are determined. An important finding, relevant to health care planning, is that most health maintenance and care are delivered in and by the popular sector (35-37).

Figure 1. The Health Care System (Source: Kleinman (35, p. 50)

There is an ongoing reciprocal interaction between the

different levels of care within the popular sector, the professional and folk sectors (35). Importantly, the decisions whether to seek or adhere to professional advice or prescriptions and the assessment of outcome are mainly made by the popular sector. The folk sector includes the non-professional specialist (alternative or traditional medicine), often minimally regulated and sometimes illegal forms of care. WHO has advocated cooperation between professional and folk sectors (38-39), and cooperation between "the two worlds" is reported to be in progress in both developing and industrialized countries (40).

To the study of illness behaviour and health care utilization Kleinman's concept of Health Care System represents a valuable reconceptualization of health care delivery systems as reciprocal arenas of care. Chrisman and Kleinman stress the "need for a soli d understanding of illness in the popular sector as an important aspect of clinical work, .. and a central element in the education of health practitioners" (13).

Approaches to studying the use of professional health care services

The literature on professional health care utilization is extensive. In his overview of the literature on the use of health and welfare services, McKinlay (30) reported that "the

writings about empirical findings appear to have been generally more substantial than the findings themselves". He refers to six research strategies within this research area: 1) the economic- (financial cost as the main determinant), 2) socio-demographic-, 3) geographic-, 4) social-psychological-, 5) socio-cultural and 6) the organizational (delivery system, client-agent relationship) approaches. Within the various areas relatively sophisticated models have been elaborated, in particular within the social-psychological approach, for example "The Health Belief Model" and the model elaborated by Mechanic (28). Although the various approaches and particular models are based on different theoretical perspectives and are established to explain different types of behaviour, the explanatory factors included are mostly quite similar (41). According to several reviews, once "illness" measures have been taken into account, most other factors have been inconsistently related to health care utilization (26, 42-44). Contributing factors to some of the observed contradictions are the varying conceptual and methodological approaches, differing medical care systems and different time periods.

An issue of particular concern in the study of health care consumption is related to the attainment of the goal of equity in access to professional health care services. It represents one of the cornerstones of the global strategy of Primary Health Care Approach and is primarily concerned with equal access for equal need. This implies that equity is most appropriately judged by examining people's use - relative to

their illness experience. There is, however, lacking consensus as to how to measure the accomplishment of the goal. Despite many sophisticated models of health care utilization developed, considerable confusion exists concerning the concept of "barrier to care" (43-44). The theoretical framework developed by Andersen and co-workers (Andersen model) appears as the guide most frequently used by researchers addressing this type of research questions (17, 45). The main issue here has been to test the extent to which other circumstances than "need for care" can explain the use of medical services. The postulate is that use is dependent on: 1) the predisposition of the individual (predisposing variables like demographic and social characteristics, and beliefs); 2) his ability to secure services (enabling variables like own personal resources and availability of health services; 3) illness level which includes bot measures of perceived illness and illness "evaluated" by professionals. To measure "evaluated" illness (for example by a panel of professionals), however, is exceedingly expensive to "operate", a fact that seems to explain the great variation in the operationalization of "need for care" by different researchers using the Andersen model (26). The results from most studies employing this framework are consistent with the hypothesis that only minor inequalities exist in the use of health care services. These findings, however, contrast qualitative literature on use of health care services (43).

As stated by Mechanic (26), varying approaches are needed to

study the process of illness behaviour and the use of the different types of health care services. Each approach might be limited in some way or another, but only through a synthesis of information from alternative strategies one can piece together a more comprehensive picture. In various ways the method of data collection will have an effect on the results. This seems in particular to be demonstrated by the reported striking discrepancies in results between the qualitative and the large-scale multivariate studies (the survey method) (43). An important aspect is the distinction between quantity versus quality, the importance of taking into account the limitations of measuring only the quantity (for example the volume of use) and ignoring the quality of activities like the patient-provider relationship. An important lesson learned is that both the survey methodology and the qualitative methodology offer benefits and limitations indicating the two strategies to be combined.

As to the methods another important aspect is retrospective versus prospective designs. Most studies till now have been retrospective, introducing recall problems and biases linked to the fact that retrospective behaviour is collected at the same time as health status and attitudes. More sophisticated prospective designs (one possible approach being panel reporting by means of health diaries) have been introduced during the last decade. These methods, however, introduce various other possible biases like use of proxy respondents, sensitization and fatigue (46). It is, however, not known to

what extent these weaknesses represent important biases (46).

The current increasing consumption of primary health care services (47) represents an issues of great concern. The introductory remark on the "Pippin perspective" as opposed to a position where health includes "all what is good in life", obviously seems to have some relevance in this context. Although the increasing consumption may partly be explained by the strong increase in the number of GPs, it may as well both be a reflection of - and have led to a change in - the population's health concepts and illness behaviour. Accordingly, it represents an important challenge to the professional health care delivery system, in particular related to the issue of cost containment and priority settings. In that respect contributions trying to penetrate mechanisms involved in health-evaluations and illness in the popular sector seem badly needed.

2. THE PRESENT STUDY

Purpose

The main purpose of the present study was to explore

- factors and dimensions influencing self-evaluated overall health status.
- factors affecting the use of particular professional health care services,
  - primary health care (general practitioner visit)
  - secondary care (referral care services:specialists, hospitalization).

Empirical basis

The empirical basis exploring the two principal topics, self-evaluation of health and use of professional health services, stems from three population surveys from Northern Norway (see Table 1), one from a mainly urban population (Tromsø, total population 50,000) and two from County populations (Finnmark, total population 74,000, and Nordland, total population 240,000).

Table 1. The three population surveys. Survey area, age, eligible population, attendance at the screening and response rate to questionnaires.

Research area	Year	Age 1)	Eligible popul.2)	Attenders n (rate)	Response rate 3)
Tromsø III	1986-87	12-61	26846	21826 (81)	92
Finnmark III	1987-88	20-62	21109	17808 (84)	62
Nordland I	1988-89	40-42	10497	8612 (82)	87

1) The present study includes men aged 20-61 and women aged 20-56 (the Tromsø survey), men and women aged 30-62 (the Finnmark survey), and from the Nordland survey all participants aged 40-42.

2) No information was requested from non-attenders in the Nordland survey, thus numbers invited are given.

3) Per cent of the attenders who responded to all questionnaires (ie. Tromsø and Nordland q. II and Finnmark both questionnaires II and III.

- Sampling: The Tromsø survey: All residents selected in age-group 20-61 in men and 20-56 in women, in the age-group 12-19 a 10% random sample.

The Nordland survey: All residents in the selected age-groups invited.

The Finnmark survey: All participants aged 40-62 invited, and a random sample from residents aged 30-39.

Approaches, an overview

Self-evaluated health

An important premise is that health evaluations are made relative to capacities for role or task performance. Changes in usual physical and psychological functioning may or may not have any impact on the perceived health status. How persons judge their own health is affected by the way physical and psychological symptoms, disease labels (or other kinds of signals from health professionals or other status definers) are comprehended. This perceptional process depends on statuses and roles, social-psychological and various situational and behavioral factors.

In the first analysis (Paper I) a "prediction" analysis (multiple linear regression) has been used to examine the relationship between self-rated health (dependent variable) and a specified set of independent variables (grouped into reported diseases and medications, reported symptoms, psycho-social problems, physiological measures together with life-style indicators, and sociodemographic and family life characteristics). This multivariate technique is sorting out the effect of one independent variable (or group of variables) upon the dependent variable after taking into account the effects of the other independent variables (or groups of variables).

The second analysis (Paper II) makes use of causal analytical strategy. A causal analysis is divided into a theoretical (modelling) and an empirical component. In the theoretical part the causal structure of the "process of health evaluation" was specified, ie. specifying the relationship between the model variables in terms of ordering. This makes it possible to establish a linear structural equation model with a set of several equations which are connected in a system (48-49). In the empirical part the statistical relationships between the variables were estimated, here by employing the Lisrel programme (50-51).

Use of professional health care services

With relevance to studies of health care utilization in Norway, some particular characteristics of the professional health care sector should be emphasized. The ideology of the welfare state aims at giving the individual a right to care in case of illness and disease and also emphasizes the importance of employing measures to secure equality in access to the health care. One of the most important measures have been to eliminate financial and geographical access barriers, at least in terms of the use of those services considered in present analyses. A reasonable assumption is that there are no financial access barriers related to the use of general practitioners, specialists and to hospitalization. Another measure, seemingly important to employ in order to obtain

equity in access, is the establishment of strict rules of referral, where primary care providers are given the role as "gatekeeper" to monitor referral care.

The information about use of services is in the present study based on retrospective reporting (one year recall). Types of services studied were GP visits (excluding industrial physician), use of specialist services and hospitalization. Relative to the employed explanatory model a necessary distinction was made between patient-initiated use and provider-initiated use. The provider-initiated use was studied by estimating the probability of referral (dependent variable: consumers with GP visit only versus referral care users, thus excluding non-consumers). The model explaining GP visits is assumed to be different compared to the model on referral.

The "ideal" referral system should reveal "need", here measured as health status/disease, as main determinants. The hypothesis is that the probability of referral is additionally affected by characteristics of the professional sector (like the GP/population ratio, geographical proximity of facilities, lack of primary provider), socio-demographic characteristics (in particular age, sex and educational attainment). A logistic regression model was used to estimate the suggested determinants.

GP visits are seen as primarily being patient-initiated. This assumption, however, might be questioned and will be discussed

later. Present approach represents an integration of previously known approaches, seen as being partly complementary (socio-demographic-, geographic-, social-psychological approaches).

In the first analysis (Paper III) the established model focuses on five categories of factors: Health status/disease (Self-evaluation of health, perceived symptoms including frequency, transitory morbidities,chronic disease), lack of primary provider, socio-demographic characteristics, family characteristics also including situational constraints and family history of disease, and health promoting lifestyle. In addition to most factors included in the first model, the second analysis (Paper IV) focuses the attention on some supplementary factors: availability of health services, social network (other than family network), and internal/external locus of control and preoccupation with health. The two papers mentioned present prediction analysis of GP visits. Paper V presents a causal analysis based on the structural equation model established on self-evaluation on health.

SUMMARY AND MAIN CONCLUSIONS OF THE PAPERS

Main topics.

Two main topics are dealt with:

1. Self-evaluated health: the influence of various dimensions of health status, disease, physiological measures, socio-structural and behavioral factors (papers I and II).
2. Determinants of professional health care utilization: Models including characteristics of the popular and professional sectors (papers III, IV, and V).

Empirical basis.

The three sets of data which were available for the present study stem from three different population surveys (Table 1): The Tromsø Study 1986-87 (papers I and III), The Finnmark Study 1987-88 (papers II and V) and the Nordland Study 1988-89 (paper IV).

1. Self-evaluation of health

The first paper examines the relationship between self-rated health and reported diseases and medications, symptoms, psycho-social problems, physiological measures together with life-style indicators, cardiovascular risk profile and socio-

demographic and family life characteristics. The data originated from a population study of 9408 men aged 20-61 and 9152 women aged 20-56 in Tromsø, and the analyses performed by multiple regression technique. Reduced self-evaluated health was found to be closely related to symptoms and diseases connected to the musculo-skeletal system and psycho-social problems, and less to age and some of the major chronic diseases. Physical activity at leisure time and workload were positively associated with self-evaluated health. The findings indicate that an important dimension reflected by self-evaluation of health is the individual's perception of own physical performance and suffice in general.

The second paper explores determinants and dimensions involved in self-evaluated health by making theoretical causal specifications of linkages among various dimensions of health status/chronic disease, physiological measures, social-structural and behavioral/attitudinal factors. This structural equation model was employed on data from a population survey in Finnmark County (1987-88), including 4549 men and 4360 women aged 30-62. The main findings from the Tromsø study were supported: First, that physical symptom experience, here measured as pain from various parts of the body, plays a more crucial role in reducing self-rated health than the burden and labelling associated with diagnoses of chronic disease. Second, the suggestion that the important dimension reflected by global self-evaluation of health is the overall interpretation of own suffice in general. The

analytical model employed when analyzing the Finnmark data adds some important dimensions not being considered in the first study. Dependence on permanent disablement benefit was found to play the key role in reducing self-evaluated health, and the seemingly strong labelling impact of permanent work disability contrasted the modest effect of diagnoses of chronic disease. Moreover, the impact of this key factor and other important determinants was found to be strongly socially patterned. In summary, the empirical findings indicate a striking incongruity between the conditions which reduce the population's subjective perceived health and our ability to offer these conditions effective treatment through the health care system.

2. **Use of professional health care**

Decisions involved in the use of various types of services offered within the professional sector of health care were studied in three different populations, employing models that include various characteristics of both the popular and the professional sectors. Paper III, based on the Tromsø study, examines factors influencing I) general practitioners (GP) visits and II)provider-initiated referral services use (outpatient and hospitalization). The model explaining GP visits was assumed to be different from the one of referral. Marked sex differences appeared at both levels of services. The various health status dimensions were found to be

important determinants of GP visits, in particular self-rated health, physical distress and transitory morbidities. Further, having a primary provider was found to strongly increase patient-initiated use. Among the health status measures only self-rated health and chronic disease appeared as important determinants of provider-initiated use. Age and educational attainment were negatively associated with GP visits and positively associated with use of referral services. The increased referral of patients with higher educational achievement indicates a social status bias among general practitioners creating a substantial inequitable access to referral services.

In the second study, paper IV, the same types of services are explored using regression models on a set of data from a population study of 3533 men and 3578 women aged 40-42 in Nordland County. Compared to the first study the employed models included some additional factors, both related to the popular sector (social networks, preoccupation with health and attitudinal aspects) and the professional sector (doctor density, referral care facilities). Self-rated health was again found to be the most important determinant regardless of type of service. Both preoccupation with health and help seeking attitude appeared as relatively strong determinants of GP visits. Volume of resources (GP per population), socio-demographic characteristics and social networks, however, did not appear as important. The finding from the first study of an increasing referral with increasing educational attainment

was supported. High GP/population ratio and residence in municipalities with referral care facilities were both found to be associated with higher probability of referral. The model explaining GP visits predicted more visits among women, as was found in our first study. The referral model, however, did not predict any differences according to sex.

The third study, paper V, focuses the main attention on the relative importance of the influence of health status aspects/disease on GP visits. It was based on the same data set used to explore factors involved in self-evaluation of health in Finnmark, and on the same theoretical causal specifications of linkages among various dimensions of health status, socio-structural and attitudinal/behavioral characteristics or factors. The findings confirmed the important independent role of self-rated health influencing health care utilization, both directly and as an important transmitter of effects. Furthermore, that high preoccupation with health increases GP visits, indicating that "intervention" trying to increase general health awareness in the population not to represent a viable "method" hampering the increasing health care utilization. Finally, in men disability pensioning turned out to have a strong negative direct impact on GP visits.

3. GENERAL DISCUSSION

3.1 Methodological issues

Simplifying assumptions and possible types of biases

The present study focuses on factors involved in health perceptions and the use of professional health care services. As in most research on social phenomena the complexity involved is immense, and in any attempt trying to penetrate aspects of reality it will be necessary to make a series of simplifying assumptions. The core of this problem has been described by Blalock (49): "..if we are ever to understand the nature of the real world, we must act and think as though events are repeated and as if objects do have properties that remain constant for some period of time, however short. Unless we permit ourselves to make such simple types of assumptions, we shall never be able to generalize beyond the single and unique event". The development of theoretical models of reality represents a way to deal with the problem, introducing the dilemma of how much to oversimplify reality (49). Some of the simplifying assumptions will clearly be more realistic than others, and some of them will even be untestable. In the present study various models have been established and assessed empirically. The simplifying assumptions and possible biases involved are many. Bias is seen as any source of distortion or misinterpretation due to questionable methodology. The literature presents a variety

of ways of classifying bias. Reference is made to the "Miettinen's terminology" (52), which delineates confounding, selection, and information biases. The confounding issue is dealt with later when discussing multivariate analysis.
Selection bias refers to a type of distortion that may result from the way subjects are selected for the study, and the main source of selection bias with regard to the present study will be discussed in detail later (non-response).
Information bias refers to a distortion due to measurement error. It should be noticed that the two main types of measurement errors (random versus nonrandom errors) are termed in a variety of ways, and that such differences are most prominent when comparing epidemiological literature (52) and the sociological tradition (49, 53). Systematic error (non-random error) occurs when there is a difference between what is actually measured and what it purports to measure (most often termed "validity" by sociologists, ref. 53). The random error is often termed "reliability" or "precision".

In general it is difficult to obtain sufficient information in order to quantify these types of biases, although the direction of a particular bias might very often be assessed (52). Furthermore, measurement errors do generally attenuate both correlation and regression coefficients (49). Both validity and reliability might partly be improved by using summary measures or constructs. In present study summative indices and factor analysis have been employed in order to handle composites of different measures. Factor analysis (54)

represents an appropriate instrument when dealing with interrelated constructs (concepts or dimensions). What the method does in principle, as employed in present study, is to tell which measures belong together, and how much they do so. A high number of variables can thus be replaced by a hypothetical construct, referred to as factor, and to be employed in multivariate models.

Before the discussion of main findings, some particular methodological issues will be emphasized.

Three different sets of data

The three sets of data available for the present study are from three surveys conducted during the period 1986-1989, and covering populations from Northern Norway, one being mainly urban and the other two are county surveys. Further, the invitation to participate included everybody residing in the geographic areas and in the selected age-groups (except for residents aged 30-39 in Finnmark, Paper II). It is important to note having three different sets of data available gives an additional opportunity to test the generalization of findings through external replication (55). This opportunity is exercised in various ways in the present study. First, the replication of the same variables in different samples. Second, the replication involves different samples and a combination of same variables and different variables. It

should be recognized, however, that the empirical data may not be representative of adults beyond the geographical region included.

Non-response bias

Selection bias "may be present in any situation when persons with different diseases or characteristics in any type of population enter a study group at different rates or probabilities" (56). The most important source of selection bias in the present study is nonresponse, either non-attendance to the screening or non-response to the postal questionnaires. The strength of the relationship between two variables, however, may be affected only if variation in response is related to both the dependent and the independent variable. Non-response thus may or may not affect the associations. The best way to avoid non-response bias is to increase the response rate, and in the survey from Tromsø and Nordland both the attendance rate and the response to questionnaires are to be judged as (at least) impressing (Table 1). In the Nordland survey we lack information about reasons for not attending the screening. Based on this type of information from other county surveys, the attendance rate in the available population has been estimated to be approximately 85-90 % (57). Our analyses of attendance and questionnaire response of the Nordland survey indicate that the data give reliable information about the invited

population (57).

The attendance rate achieved in the Finnmark survey was at the same level as the two other studies. Due to a somewhat extraordinary low attendance achieved in age-group 20-29, however, the decision was made to exclude this age-group from the present analyses (Paper II). The most important problem in terms of possible non-response bias in present study seems to be related to the particular low response to questionnaires appearing in the Finnmark study (Table 1, and Paper II). The analyses of differences between responders (ie. those attenders who responded to all questionnaires) and non-responders of questionnaires and possible distortions of estimates warrant some further elaboration. The massive amount of information available on individuals defined as non-responders (Paper II), presents an excellent opportunity to address the problem of selection bias. In accordance with other studies (57-59), there was no clear evidence of marked effect of sex and age on response rate. Table 2 and 3 reveal that non-responders differ from responders in a number of characteristics, although most of these differences are relatively minor. Interestingly, the pattern and strength of the differences between the two groups appeared very close to what was found in a similar study from Tromsø (58), and the one from Nordland (57), both with very high response rates. Most studies seem to find a somewhat higher tendency of non-response in lower social status groups (60). The overall tendency appearing in Table 2 and 3, in particular the finding

of more daily smokers, less sedentary occupation (in men only), less leisure physical activity, and slightly more disability allowance among non-responders, indicate higher response rates among the higher socioeconomical or educational groups.

In what way might the high non-response rate in the Finnmark survey influence the estimates (Papers II and V)? The available data allow for indirect explorations, and an example of type of analysis possible is presented in Table 4. The estimates of independent effects of selected myocardial risk factors on total serum cholesterol appeared surprisingly stable when comparing estimates based on attenders and responders respectively. The most consistent result (Table 4), however, is the underestimation of the "effect" of daily smoking, the characteristic showing the greatest difference when comparing responders versus non-responders. Although this exercise does not provide us with a definite proof of possible violating biases due to non-response, it indicates this type of bias to be of minor importance.

Multivariate analysis

Regarding the different analytical strategies employed in present study, the focus here will be on the important distinction between the two main uses for regression equations (49), the "prediction" analysis (Blalock preferred the term

"estimation" analysis) and the "causal" analysis. The problems encountered when dealing with prediction versus causal relationships are theoretically different. In the former type the direction of causality is on principle irrelevant, the "estimation is a symmetrical matter in which temporal sequences need not be involved" (49, p 43). In the present study this analytical strategy has been used to sort out the effect of each independent variable on the dependent variable after taking into account the effect of all other independent variables. Using regression equations as causal equations, however, involves a crucial first step of making theoretical statements about causal ordering or priorities among variables. Causality is here conceptualized in terms of simplifying models (49). The next step is to make use of a set of simultaneous equations (linear structural equation models), including simplifying assumptions about error terms or disturbance terms (allowing for influence of outside, ie. unknown or known but omitted variables) (50-51), in order to estimate the magnitude of regression coefficients. These estimates are checked against the data, for instance to detect specification errors, and the model might either be accepted, rejected or altered. Since several models which fit the data can be found, accepting a model should be interpreted to mean that (for the time being) the most likely "candidate" is demonstrated (50). An important realization, however, is that causal judgements belong to the theoretical level and thus can never be demonstrated empirically. According to Blalock (49) this is true both in nonexperimental situations and when

experimentation is possible. In particular, since the main simplifying assumption made, that "the model takes care of all relevant variables", can never be tested empirically.

The theoretical argument underlying several of the specifications made regarding the causal models proposed in the present study (Papers II and V) might be weak. In particular this relates to the assumption of only one way (recursive) effects. As previously mentioned, the privilege of having three different sets of data available presents the opportunity of different types of external replications. The two main uses of regression equations have been employed in different sets of data, trying to explore the same phenomena (self-rated health and GP visits as ultimate dependent variables). Thus, overall judgements of results might at least give important information about the consistency of findings. In addition to variation in analytical strategy, however, these overall judgements have to take into account the introduced variation in included variables (regarding the use of single indicators versus the inclusion of constructs). In terms of stability judgements this kind of "flexibility" might represent a benefit. The main findings based on the Tromsø study (using "prediction" analysis, Paper I) were supported by the data from Finnmark (causal analysis, Paper II). A similar comparison made regarding the exploration of GP visits, comparing results presented in paper V (causal analysis) and papers III and IV, gives an indication of the same. The particular causal model established here, however,

is mainly focusing on the influence of dimensions of health status/disease, thus making the comparison of somewhat limited value. All in all, the high stability in results, regardless of analytical strategy, represents at least additional indications of substantiality.

3.2 Self-evaluation of health

Theoretically self-evaluation of health is seen as a kind of interpretational process where capacities for role and task performance represent an important frame of reference. In the present study the main focus has been on the role played by statuses and other demographic factors, various situational factors and health behaviours on the determination of chronic disease and the various health status dimensions, and ultimately self-evaluation of general health status.

The differences between the two present analyses performed on self-rated health warrant some additional focus. Besides the previously focused difference in analytical strategy, there is some market variation in the way to solve the measurement problem. In particular the use of single item measures versus summary measures or constructs. Further, disablement benefit and fear of unemployment are included in the second analysis (Paper II). The seemingly conflicting findings regarding the effect of age and educational attainment between the two analyses seem to be partly attributed by the inclusion of

these additional measures. Regarding the construct "workload" (Paper I) this measure is assumed to partly tap the same dimension as disablement benefit. Per cent individuals receiving disablement benefit in this particular population, however, was found to be relatively low. In spite of these methodological differences, the findings are in essence strikingly consistent. First, that physical symptom experience, either measured as pain from various parts of the body (as a construct) or as single-item measures primarily tapping musculo-skeletal distress, plays a more crucial role in reducing self-rated health than the burden of labelling associated with diagnoses of chronic disease. Second, the revealed effect of either disability pensioning or workload, and leisure physical activity.

Educational attainment is seen as the most important factor influencing social status attainment. The results based on the established causal model (paper II), demonstrate those factors having the strongest impact on self-evaluated health to be clearly socially patterned: with decreasing educational attainment; more illness experience (except for psychological distress), chronic disease, higher myocardial risk score, more disablement benefit, and lastly less preoccupation with health. Most striking in this regard is the strong labelling impact of permanent work disability (an effect clearly contrasting the modest effect of diagnoses of chronic disease), creating a strong indirect effect of social status on self-rated health. The population studied, however,

encompasses a complex cultural and ethnic diversity. The proposed model can thus be elaborated further by including additional variables. An example is the interesting issue of to what extent illness recognition and self-ratings are linked to reference-group comparisons or "capacities relative to the performance of roles". There seems to be a scarcity of systematic research about how factors other than illness and disease, age and gender influence the way people come to evaluate their own health. The literature presents conflicting results regarding the impact of social status (14, 21, 24, 61-64). Some of these variations might be attributed to varying conceptualizations and operationalizations of health status. In a study from Norway (64) the effect from "socio-psychological" variables (sex, age, work and socio-economic status, family/life cycle) on self-rated health was estimated after controls for a extensive assortment of "medical model" variables (number of illness episodes, total duration of illness/injury, diagnoses and functional impairment). Socio-psychological factors appeared here to have only marginal independent effect, a result that apparently contradicts much of the previous research. The author suggests that the independent effect of "non-medical" variables, revealed in much of the previous studies, might be attributed to deficient "medical" information available. Since health status variables often are highly correlated with "socio-psychological" variables, such a suggestion might warrant concern. Nevertheless, as Mechanic suggested (43), by including "illness" variables seen as summary measures of

illness behaviour might often mask the effects of social and situational factors. The variable "number of illness episodes" as used in that particular study (64) seems to represent a typical example of such a summary measure. Furthermore, the usefulness of such non-specific measures might be questioned.

Health optimism

The various studies showing self-rated health as an independent predictor of survival obviously provide a good argument regarding the importance of self-ratings (16, 21-23). There will, however, always be a possibility of biases due to confounding factors not being considered or controlled for, particularly in such a complex testing situation. Most of the population-based studies of self-ratings and mortality have relied on self-reports of physical health and no "objective" measures on health status when testing the net effect of self-rated health. Only one of the studies seems to have used comprehensive, standardized physical examination as statistical controls for physical health status (22). Self-rated health appeared to independently predict mortality very strongly for men aged 45-64, but not among elderly men and females. Thus the findings from this study did not fully support the findings from other studies, and the authors attributed the differences to variation in study design (22).

Nevertheless, the indication of self-rated health as a powerful predictor of mortality have been subject to speculation on possible mechanisms involved. First, the possibility that perceived health might record occult disease, although present but not possible to diagnose or measured by any other measure (21). Second, that the perception of one's health as either poor or excellent engages psychophysiological mechanisms influencing host resistance (21), or as suggested by Kaplan et al.: "self-rated health might indicate a subjective state that has its own health consequences" (23). In particular the latter possibility introduces interesting perspectives regarding the value of self-ratings of general health status. Accordingly, such ratings appear as a valuable indicator per se, and to be used in various evaluational contexts. It suggests that "activities" trying to pave the way for more "health optimism" in the population might have positive health benefits. The overall pattern revealed in present exploration of factors and mechanisms influencing self-evaluated health, however, is not very encouraging regarding the potency of the professional health care sector in improving general health optimism. The main indications seemingly supporting such an pessimistic position is: 1) the striking incongruity between the conditions which reduce the population's self-evaluated health and our ability to offer these conditions effective treatment through the health care system 2) measures trying to reduce negative health effects related to problems of getting access to the labour market are strictly political 3) "traditional" health educational

activities might have limited impact and, regrettably, some important negative side-effects (paper II). All in all, these are indications seemingly supporting the multisectoral approach in primary health care, suggested as one of the main components of the Primary Health Care Approach (5).

3.3 Use of professional health care services

Design and model assumptions

Various possible biases related to the use of cross-sectional design exploring health care utilization have been focused on in the papers. Among these are the introduction of: 1) memory bias (Paper III); 2) biases due to the fact that retrospective reports on behaviour is collected at the same time as health status (and not prior to treatment), beliefs/attitudes (Paper IV) and lack of primary provider; 3) bias related to the problem of making clear distinction between different reasons for encounter (Paper III and V). Analyses performed seem not to indicate the type 1 bias having important influence. Particular results possibly influenced by type 2 biases are the effect of "health attitudes" and "lack of primary provider". The latter problem might represent a substantial bias, and it seems reasonable to conclude that the strong positive effect of having a primary provider is somewhat overestimated. The type 3 bias should be linked to the

assumptions made in present study regarding the most realistic way to distinguish between patient-initiated versus provider-initiated use. Decisions involved in health care utilization are likely to be influenced by the way the professional health care sector is organised. For instance, in a population with a health care system using strict rules of referral, as assumed relevant to the populations studied, the use of other than primary provider services are principally provider influenced. Another assumption made was that GP visits are primarily patient-initiated (the patient alone or lay consultants). Since the data do not contain information on the reason for encounter and who initiated it, the possibility of evaluating these assumptions is restricted. The performed evaluations (papers III and IV) seem to indicate that use of referral services are primarily provider-initiated. One of the studies, however, revealed that those who might be defined as "direct" users differed on various respects from other referral care users, indicating some proportion, although seemingly minor, to have direct access.

The literature suggests the factors influencing use of preventive health care services may be different compared to other types of utilization (65), in particular that health status do not play an important role influencing preventive health care seeking (65). In the present study it seems reasonable to assume preventive visits to represent a minor proportion of visits, indicating the employed explanatory models to be reasonably appropriate (Papers III and V).

Inequalities in use

Concepts of equity of excess to professional health care is clearly normative, and thus different concepts might be established. Accordingly, the selection of operational definition is not merely an empirical issue. The position of "equal access for equal need" seems to reasonably cover what is appearing as societal consensus in terms of equity. Such a crude "definition", however, only partly solves the operational problem. The position in present study (Papers III and IV) implies that equity of access is basically judged relative to illness/disease experience, a position principally quite similar to the framework proposed by Andersen and Aday (17). Differences in model variables, however, involve both the included illness measures and what is seen as reasonable assumption on "barriers". Moreover, an important distinction was made between type of use studied.

In the present study educational attainment is seen as a relevant indicator for social status. The present findings are in accordance with previous Norwegian studies reporting no social inequalities regarding GP visits (37, 66-67). The explanatory model on referrals, however, revealed a substantial existing bias towards the higher social status groups. Unfortunately, another Norwegian study trying to explore this issue presents interpretational difficulties (68). From UK, with a very similar health care system compared to Norway, many studies have revealed social

inequalities in the availability and use of services (69). The Black Working Group concluded that the evidence seems to support the Titmuss's argument that "higher income groups know how to make better use of Service; they tend to receive more specialist attention;...". It was admitted, however, that the existing data on GP visit and hospital in-patient and out-patient attendance was difficult to interpret, primarily due to the problem of relating utilization to need (69, p 206). Studies using qualitative methodologies have presented various explanations relevant to the phenomenon of higher probability of referral among higher educational groups. Furthermore, that quantitative studies need to be supplemented by qualitative approaches in order to fully disclose the subject matter, particularly the very often observed phenomenon of social inequalities in quality of care received. (30, p 132-138, 69, p 79, 70). The studies from UK reporting middle-class receiving better care, revealed working-class patients to be more satisfied (70). Regarding the latter finding, an inverse relationship between global satisfaction with health care services (distinctions made between primary care and hospital services) and educational attainment appeared in analysis based on the present data set from Finnmark (71-72).

Present findings revealed that geographical proximity significantly influence decisions of referral made by GPs. Previous reports from Norway and the UK have shown the same kind of pattern, that use of referral services is reduced with increasing distance to secondary care facilities (68, 73).

The role of primary care providers as gatekeepers.

In the Norwegian health care system the "gatekeeper"-function of the general practitioners replaces financial barriers as a constraint mechanism on the demand for health care services. In the execution of this function the GPs are expected to distinguish "necessary" from "unnecessary" use and to discriminate between "worthy" and "unworthy" needs on the bases of a professional judgement.

As in most western societies consumer influence and user rights in terms of health care have also been focused on in Norway. It is no longer considered proper medical practice to neglect the views and wishes of the patients. This might have paved the way for a "climate" making the execution of an "unbiased" professional and/or paternalistic gatekeeper function to deteriorate. Such a change may to some extent explain the increasing use of referral services, refunded medication, sick leave pension, all benefits that should be protected by the GPs' gatekeeper function. Furthermore, it may represent a phenomenon throwing a further light on the strong impact revealed in the present study of "subjective health" and the bias towards self-efficient, educated consumers on the use of referral services. It probably reflects the doctors' problems in combining the "service" and "gatekeeper" function. As it is, doctors are at the same time blamed for being consumer antagonistic and paternalistic and too permissive with public resources. GPs seem to be in need

of a new mandate or basis for performing the gatekeeper function as intended, both in protecting public resources from being inequitably distributed or overused, and patients from what may be harmful overuse of health care services and medication.

Alarming projections?

Some results of the present study might be discussed related to the currently increasing consumption of primary health care services. Reference is made to the "Pippin perspective" as opposed to the seemingly prevailing fascination with personal health. The findings suggest that the higher morbidity with increasing age is not reflected in their health seeking behaviour. Especially startling in this regard is the revealed indication of a lower threshold for visits to the GP among younger than older men (Paper III). This result is susceptible to be interpreted as a changing trend in help-seeking behaviour between generations, and thus indicating alarming projections in terms of demands and "overuse". Based on the present study, however, this interpretation is speculative. It is worth noting that previous Norwegian studies, based on data from 10-15 years back in time, did not reveal any significant effect of age when taking into account "need for care" (66, 68). However, this may have changed and further exploration of cohort-related changes in illness behaviour seems urgent.

Table 2. Responders (responded to all questionnaires) compared to non-responders, according sex and various physiological measures. The Finnmark Study 1987-88, age-group 20-62.

	RESPONDERS		NON-RESPONDERS	
	Men	Women	Men	Women
Subjects (n)	5525	5480	3487	3317
Age	47.59	47.47	46.87	46.35
Heart rate	73.67+	77.27	75.36***	78.42***
	(13.31)	(12.56)	(13.56)	(13.25)
Height	173.98	161.15	173.05***	160.43***
	(7.04)	(6.54)	(7.17)	(6.48)
Body mass ind.++	2.60	2.56	2.61	2.59**
	(.33)	(.45)	(.35)	(.47)
T-chol*	6.55	6.57	6.65**	6.63*
	(1.29)	(1.44)	(1.31)	(1.42)
Systolic BP++	136.81	131.44	137.69*	131.94
	(17.24)	(19.52)	(17.50)	(19.76)
MIRS++	51.87	9.02	60.58***	10.43***
	(73.27)	(14.47)	(88.02)	(15.85)

Statistical significance for the difference responders versus non-responders:*** p< 0.001, ** p< 0.01, * p< 0.05.
+:All means are adjusted for age, (standard deviation) is unadjusted.
++ Body mass index: g/cm2, T-chol: Total serum cholesterol (mmol/l), Systolic blood pressure (BP): mmHG,
MIRS: (myocardial infarction risk score)

Table 3. Responders (responded to all questionnaires) compared to non-responders, according sex and various characteristics (% individuals, adjusted for age). The Finnmark Study 1987-88, age-group 20-62.

	RESPONDERS		NON-RESPONDERS	
	MEN	WOMEN	MEN	WOMEN
Subjects (n)	5525	5480	3487	3317
Married	69	74	66*	72*
Domestic work as main occ.	2	38	2	39
Chest pain	11	10	13*	12**
HBP-medication 1)	7	9	7	9
Morning coughing	16	10	19**	13***
Daily smoker	50	43	57***	50***
Leisure act.1)	22	9	19*	7**
>9 cups of coffee	31	20	34***	23***
Sedentary occupat.	38	30	33***	28
Shift work	17	11	17	12
Unemployment all.	7	5	8*	5
On sick leave	7	8	7	8
Disability all.	12	18	14**	21**

Statistical significance for the difference responders versus non-responders:*** p< 0.001, ** p< 0.01, * p< 0.05.
1): HBP: High blood pressure, Leisure physical activities: at least at a keep-fit exercise level

Table 4. Comparisons of multiple regression analyses of total serum cholesterol with selected myocardial risk factors as independent variables among all attenders (8981 men and 8771 women) and responders to all questionnaires (5509 men and 5465 women). The Finnmark Study 1987-88, age-group 20-62.

	ATTENDERS		RESPONDERS	
	Reg. coeff.	t	Reg. coeff.	t
MEN	(n = 8981)		(n = 5509)	
Age-group (1-9)	.155	21.9	.157	17.6
BMI	.772	19.6	.780	15.5
Coffee cons. (1-5)	.155	9.3	.161	7.6
Leisure time act (1-4)	.052	2.9	.068	3.0
Physical act at work (1+4)	.041	3.4	.039	2.5
Daily smoker (0,1)	.082	3.0	.065	1.9
R^2	.113		.119	
WOMEN	(n = 8771)		(n = 5465)	
Age-group (1-9)	.332	45.4	.338	37.0
BMI	.402	12.9	.445	11.1
Coffee cons. (1-5)	.086	5.0	.090	4.1
Leisure time act (1-4)	.029	1.2	.033	1.1
Physical act at work (1-4)	.064	3.6	.066	3.0
Daily smoker (0,1)	.202	7.0	.174	4.8
R^2	.237		.251	

4. CONCLUSIONS AND SUGGESTIONS FOR FURTHER RESEARCH

Conclusions

Reference is made to the conceptualization of health, illness and related behaviour, the health care system, and the theoretical considerations related to model suggestions.

The findings suggest burden of physical distress and incapacity or insecurity related to opportunities for employment having the strongest independent effect on the way people come to evaluate their own health. Regarding the magnitude of the effects, the impact of these factors is contrasting the more modest impact of both chronic disease and psychological distress. Leisure physical activity was found to play a substantial and positive role in terms of health perceptions, while sex, age and myocardial risk score did not appear important. Finally, the factors affecting self-ratings demonstrated a consistent socially patterned distribution, in particular those factors related to incapacity/opportunity for employment.

The overall pattern of the main results seems to suggest that a major dimension reflected by self-rating of health represents a summary of sufficiency or capacity judgements made by the individuals. The supposition is that these capacity judgements have no absolute reference point.

The explanatory models employed on primary provider (GP) visits are based on the assumption that most visits are patient-initiated and only a minor proportion being strictly preventive. The employed health status/disese measures appeared as the most important determinants of use. Among these, self-rated health was consistently revealed as one of the most important. When taking into account the individual "need", indicated by various health status aspects/disease, no marked variation in the visit pattern appeared related to social networks and the availability of health care services (GP/population ratio, geographical proximity of facilities). The data present no indication of existing social and geographical (rural vs urban) inequalities in the use of primary care services. Relative to "need", findings suggest higher use among women, those having a particular primary provider, and young adults (in either sex). Furthermore, disability pensioning to result in a marked "underutilization" in men. The assumption of the existence of some kind of "generalized expectations" about health and illness was tested, showing a substantial increasing effect of the measure assumed to tap "external health locus of control". An apparently different dimension, preoccupation with health, tentatively included in the present study, appeared to substantially increase visits. Finally, the results related to "positive lifestyle" and use was somewhat inconsistent and difficult to interpret.

The empirical findings on the use of referral care services

(specialists, hospitalization) suggest both social and geographical inequalities. A reasonable interpretation seems to be that primary care providers are biased toward higher social groups. Moreover, findings did not support the assumption of reduced likelihood of referral with increasing GP/population ratio.

Suggestions

1. Prospective cohort design

The cross-sectional design has obvious limitations and should be extended or supplemented by data analyses based on a prospective cohort design. The prospective approach is generally preferred for making causal inferences, particularly in the present context since the number of simplifying assumptions might be reduced considerably. With particular relevance to illness behaviour/use of services, such a study should start with a base-line including "background" illness/disease, previous utilization and other relevant characteristics of the various sectors of health care. Ideally, the base-line should be followed by a "continuous" reporting on events and related actions (within the popular sector, related to the professional and folk sectors), including also transient illness episodes not acted upon. Another methodological important aspect would be to select communities differing with respect to demographic and economical background characteristics, and supply and

organization of health care services.

2. Quantitative versus qualitative approaches

To combine the quantitative and qualitative approach seems to be an important challenge in order to further penetrate the "process" (ie. the dynamics of relational links between the individual and the social) of self-evaluation of health and the closely related issue of the behavioral aspects involved. The suggestion made by Galtung (55) seems highly relevant to most of the issues focused on in present study: "..,our plea is not for change from one type of data to another, but to a norm of social research that gives low degrees of confirmation to propositions confirmed for one type of data collection only, and much higher degree of confirmation when multi-dimensional approaches to the data problem are made use of"

3. The folk sector of health care

The folk sector of health care has not been included in the present study. With reference to the presented conceptualization of the health care system, this sector is assumed to play an important role in the care of illness. The present three population surveys included one single question on use of folk sector services, and less than 5 per cent reported any use the year preceding the interview. A recent study from Tromsø, using additional questions on the use of folk sector services, seems to indicate the original single question to underestimate this kind of use (Øritsland H, not published). Moreover, previous reports from Norway seem to

suggest that the use of alternative practitioners is increasing (40), and future studies should integrate information trying to penetrate the issue of how people differentially respond to illness in terms of popular, professional and folk sector of health care. Regarding the increasing use of folk sector services, an interesting hypothesis suggests a changing trend, from traditional healers (gifted persons, religious etc.) to what might be considered as "professional" alternative practitioners (like homoeopathists and acupuncturists).

4. Side-effects of medical practices and health education.
The assumptions related to the measure "preoccupation with health" might be questioned. However, the impact revealed might be seen as a side-effect of medical practices and health educational activities, suggesting further investigation to be urged.

5. Health effects of medicalization of unemployment?
The present striking findings regarding disablement benefit suggest need for further investigation. A follow-up study of Finnmark III has recently been performed, presenting the possibility of using prospective data.

6. Self-rated health and mortality
The present sets of data, when linked to follow-up mortality data, should be used to further examine the suggestion of self-rated health as an independent predictor of mortality.

In particular, such data will make it possible to test the ability of self-rated health versus coronary risk profile and a variety of lifestyle indicators to predict mortality. Previous studies of this kind did not have access to coronary risk profile, and in this context the present findings suggest these two measures to tap independent "dimensions".

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PAPER I

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THE TROMSØ STUDY: PREDICTORS OF SELF-EVALUATED HEALTH—HAS SOCIETY ADOPTED THE EXPANDED HEALTH CONCEPT?

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Abstract—The determinants of self-evaluated general health status were examined in a comprehensive population study of 9408 men aged 20–61 and 9152 women aged 20–56. Reduced self-evaluated health was in both sexes closely related to symptoms and diseases connected to the musculo-skeletal system and psycho-social problems and less to age and some of the major chronic diseases. Physical activity at leisure time and workload were positively associated with self-evaluated health. Our findings indicate that an important dimension reflected by self-evaluation of health is the individual's perception of own physical performance and suffice in general. There is a striking gap between the conditions which reduce the population's subjective perceived health and our ability to offer these conditions effective treatment through the health care system. This suggests differences in health concept between the medical society and the population. The association between our applied measure and coronary risk profile, based on serum cholesterol, blood pressure and cigarette smoking, was found to be almost non-existent. This supports previous findings of self-evaluation of health as an independent predictor of survival.

Key words—concepts of health, self-evaluation of health, self-rated health

INTRODUCTION

To measure lay people's subjective health may be looked upon by the medical society as a bizarre activity. Nevertheless, self-evaluation of general health has been widely used in health surveys. In particular the single self-reported item 'How would you evaluate your health overall (poor, fair, good, excellent)?' is frequently found.

Although a crude and simple measure, the subjective health rating has been shown to have independent predictive power in prospective studies. In a 9-year follow-up of adults aged 20 and over in Alameda County, California, Kaplan and Kamacho found that poor self-rating was associated with increased mortality rates for respondents over 29 years of age [1]. Further, the effect of self-evaluation on mortality was not due to its association with other variables like physical health status, health practices, social network or psychological state. Singer *et al.* found self-rated health to be a powerful predictor of mortality in a 20-year follow-up study among adults between the ages 20 and 59 in Midtown Manhattan [2]. Several studies have revealed overall self-evaluation of health as an independent predictor of survival in elderly populations [3–5]. Mossey and Shapiro found that the risk of mortality associated with poor self-evaluated health was higher than that associated with prior objective health status assessed by physicians and self-reported conditions [4].

On the basis of these findings it can be concluded that overall self-evaluation of health status is not just a proxy measure for objective health status. It might indicate a subjective state that has its own health consequences. Our premise is that health, as well as illness, are normatively defined [6]. How the individual evaluates own health, symptoms and interpret biological changes or disease labels are shaped by sociocultural and social-psychological factors. For the individual varying aspects of social situations like expected roles and tasks thus constitute an important frame of reference in the context of health perceptions.

Following this rationale, studies of the predictors of self-rated health in a population might elucidate the different dimensions of this measure. So far, studies have suggested self-rated health to be related to individuals' perception of long-standing chronic illness and number of complaints and medications, and to be among the best predictors of patient-initiated physician visits [3, 7–10].

In this study, based on a large comprehensive population survey from Norway, we examine the relationship between self-rated health and a number of components of health and illness, i.e. reported diseases and medications, reported symptoms, psychosocial problems, physiological measures together with life-style, cardiovascular risk profile and sociodemographic and family life characteristics.

METHODS

The total population of men aged 20–61 and women aged 20–56 in the municipality of Tromsø were invited to the third Tromsø study. In addition a 10% random sample of the population aged 12–19 were invited. The total number of individuals examined were 21,826, i.e. 81.3% of the eligible population. The screening started in September 1986 and was finished in April 1987. The main components of the survey were two self-administered questionnaires and measurements of weight, height, blood pressure

and serum lipids. The present study is restricted to men aged 20–61 and women aged 20–56. Questionnaire 1 was accompanying the letter of invitation and comprised questions on previous cardiovascular disease, symptoms possibly caused by atherosclerotic diseases, leisure time activity, type of work, smoking habits and consumption of salt, fat and coffee. This questionnaire was almost identical to that used in former studies in Tromsø and Norwegian counties [11, 12]. The second questionnaire, which was presented at the examination, asked for more details on topics like self-evaluation of health status, diseases and symptoms, medications, use of health services, dietary habits, alcohol consumption, physical activity, psycho-social aspects and several demographic characteristics. It was completed at home and returned by mail by 91.8% of those examined.

The present analyses were done with self-evaluation of health status as the dependent variable based on the question 'How would you rate your health overall?' with the respondent given five alternatives: (1) very poor, (2) poor, (3) fair, (4) good, (5) excellent.

The independent variables were grouped in seven blocks:

1. Sociodemographic variables: Age (in 5-year age-groups), educational background (number of years of education recoded into five groups of educational level, <8, 8–10, 11–12, 13–16, and >16 years), type of work (graded 1–4: sedentary, a lot of walking, a lot of walking and lifting, heavy manual labour), unemployment allowance (0, 1) and urban living area (0, 1).

2. Family life: Cohabitation/marriage, children in the household (10 years of age or younger), nursing needs in the household (anyone apart from children requiring nursing): all coded (0, 1), members in the household (number), workload (2, 6) composed by addition of the following two variables: level of participation in the housework (graded 1–3: do less than a quarter, more than a quarter at least a half, all or most of it) and employment status (graded 1–3: no paid employment, part-time, full-time).

3. Self-reported diseases and medications: High blood pressure medication, myocardial infarction, angina pectoris, diabetes, nitroglycerine medication, psoriasis, asthma, bronchitis, ulcus of stomach, ulcus of duodenum, rheumatoid arthritis, cancer and migraine: all coded (0, 1).

4. Self-reported symptoms: Neck/shoulder pain and headache (both graded 1–4: seldom or never, once or more a month, once or more a week, daily), low back pain and chest pain when walking fast: all coded (0, 1).

5. Psycho-social problems: Depressed the last weeks and coping problems (both graded 1–4: never or seldom, sometimes, often, always), support from spouse or family in case of problems, sleeplessness: both (0, 1) and feeling of loneliness (graded 1–3: very often, now and then, never).

6. Lifestyle: Daily smoking (0, 1), leisure time activities (graded 1–4: sedentary, moderate, keep-fit exercise, athletes), consumption of alcohol (graded 1–4: number of times last year consumed at least one bottle of wine or the equivalent).

7. Physiological measures: Cardiovascular risk score (based on serum cholesterol, systolic blood pressure and cigarettes currently smoked per day), heart rate, height and relative body weight [12].

Multiple regression analyses of self-evaluated health were performed separately for each sex applying the test of subsets of independent variables and the backward elimination method in the SPSSX programs [13]. The variable was dichotomized into 0 = very poor, poor or fair and 1 = good or excellent based on careful consideration of the frequency distribution given in Table 1 and *a priori* judgement of what might be a logical distinction between 'poor' and 'good' health. Other grouping possibilities have not been analysed. In addition analysis of covariance (multiple classification analysis) [14] was used to illustrate the associations between the dependent variable and some of the independent variables found important in the regression analyses, adjusted for other independents introduced either as factors or covariates.

RESULTS

The distribution of self-evaluated health status according to age and sex is shown in Table 1. As many as 81.0 and 80.6% in men and women respectively evaluated their overall health to be good or excellent. The proportion of subjects judging their health to be very poor, poor or fair was weakly increasing with increasing age in both sexes with a steeper increase at age 45–49 in women and with a corresponding increase 10 years later in men. Between the sexes no differences appeared except for age-groups 45–49 ($P \leq 0.001$) and 50–54 ($P \leq 0.001$), where women reported a significantly lower health status than men.

Table 1. Distribution (%) of subjects according to self-evaluated health status and sex in 9408 men aged 20–61 and 9152 women aged 20–56 (Tromsø 1986–87)

	Men				Women			
Age	Poor	Fair	Good	Excellent	Poor	Fair	Good	Excellent
20–24	1.9	12.1	49.8	36.3	1.2	11.9	49.9	37.0
25–29	1.8	10.3	50.2	37.7	1.0	10.5	53.0	35.5
30–34	1.2	13.7	52.4	32.6	1.6	12.9	55.0	30.5
35–39	1.8	16.0	53.6	28.6	2.5	17.0	54.8	25.7
40–44	2.5	17.7	53.9	25.9	2.9	18.0	56.8	22.4
45–49	2.8	17.2	57.6	22.4	5.1	22.1	51.7	21.0
50–54	4.5	20.5	55.7	19.4	7.2	27.8	49.7	15.3
55–59	9.5	25.5	48.6	16.3	7.1	27.6	45.1	20.1
60–61	8.3	27.2	50.8	13.8	–	–	–	–
Total	2.9	16.1	52.8	28.3	2.8	16.6	53.2	27.4

Table 2. Results of multiple regression analyses of self-evaluated health* in 6750 men aged 20–61 and 7339 women aged 20–56 with seven blocks of independent variables, introduced as first and last block respectively (Tromsø 1986–87)

	Introduced as first block				Introduced as last block			
	Men		Women		Men		Women	
	R^2	F	R^2	F	R^2chg	F	R^2chg	F
Sociodemographic	0.019	26.2	0.027	40.8	0.001	2.2	0.003	6.3
Family life	0.021	29.2	0.017	24.8	0.007	11.9	0.006	11.3
Diseases and medications	0.062	34.4	0.077	47.0	0.017	11.0	0.024	17.4
Symptoms	0.120	230.9	0.158	343.2	0.049	102.9	0.065	156.1
Psycho-social problems	0.059	105.0	0.081	161.8	0.024	40.0	0.031	60.2
Lifestyle	0.037	87.2	0.021	52.6	0.012	33.0	0.005	16.1
Physiological measures	0.025	42.8	0.017	31.2	0.005	10.1	0.001	2.7
Total R^2 and F	—	—	—	—	0.210	45.5	0.243	59.8

*Dichotomized: 0 = poor and fair, 1 = good and excellent.

Table 2 shows the sex-specific multiple regression analyses of health status with the seven blocks of independent variables. The proportion of the variance explained by all the independent variables was 21.0% in men and 24.3% in women. The most important explanatory block in both sexes appeared to be self-reported symptoms, i.e. deteriorating health with increasing level of neck shoulder pain, low back pain, headache or chest pain when walking fast. When introduced as the first block 12% of the variance was explained in men and 15.8% in women. Introduced as the last block the corresponding proportion explained was 4.9% in men and 6.5% in women. In both sexes only a small proportion of the variance could be explained by each of the three blocks comprising sociodemographic, family life and physiological variables. The psycho-social block and diseases and medications contributed almost equally to the explained variance. While in men the life-style block showed a strong positive association to self-evaluated health, this association was far weaker in women.

Table 3 shows multiple regression analyses of health status with the single variables reaching the level of significance in either sex. In both sexes musculo-skeletal symptoms, neck shoulder pain and low back pain were among the most important predictors. Some differences between men and women appeared. Besides musculo-skeletal symptoms, leisure time activities, workload (positive association) and chest pain turned up to be important explanatory variables in both sexes, but in women rheumatoid arthritis and headache also appeared.

In the multiple regression analyses age appeared less important in predicting health in men compared to women. Possible age specific patterns were studied by performing separate analysis on subjects aged 20–29 versus those aged 50 and above only (results not given). This analysis revealed significant age differences in the pattern of predictors of subjective health between the two groups. In either sex, diseases and medications appeared more important in the oldest. Moreover, young men differed significantly from both young women and the oldest ones in the very high predictive importance of life-style, mainly the variable leisure time activities. The finding of symptoms as the most explanatory block, however, was confirmed in either sex and age-group, except from the oldest women where diseases appeared as most important.

As shown in Table 3 most of the sociodemographic and family/household variables did not reach the level of significance in the multiple regression analysis. Only in women aged 50–56 education turned out to have positive impact on subjective health. In men cohabitation and type of work was found to have an independent positive impact.

Being on high blood pressure medication, use of nitroglycerine and relative body weight were found to have an independent negative influence on health status in both sexes. Cancer, myocardial infarction,

Table 3. Results of multiple regression analyses of self-evaluated health status in 6750 men aged 20–61 and 7339 women aged 20–56 with independent variables reaching the level of significance in either sex (Tromsø 1986–87)

	Men		Women	
	Reg. coeff.	t*	Reg. coeff.	t*
Sociodemographic:				
Age-group (M: 1-9, F: 1-8)	−0.004	−1.8	−0.016	−7.1
Type of work (1–4)	0.009	2.1	−0.013	−1.2
Family life:				
Workload (2–6)	0.038	7.5	0.035	7.4
Cohabitation (0, 1)	0.038	3.4	0.001	0.1
Diseases and medications:				
Rheumatoid arthritis (0, 1)	−0.172	−4.9	−0.278	−10.5
Ulcus of duodenum (0, 1)	−0.112	−4.8	−0.145	−4.6
Ulcus of stomach (0, 1)	−0.095	−3.5	−0.133	−3.7
Bronchitis (0, 1)	−0.051	−2.3	−0.088	−3.5
Asthma (0, 1)	−0.014	−1.2	−0.072	−3.8
Psoriasis (0, 1)	−0.011	−1.1	−0.035	−2.0
Diabetes (0, 1)	−0.205	−3.8	−0.003	−0.3
Antihypertens. medic. (0, 1)	−0.131	−4.8	−0.131	−4.0
Use of nitroglycerine (0, 1)	−0.170	−3.6	−0.223	−4.4
Symptoms:				
Neck shoulder pain (1–4)	−0.055	−10.7	−0.046	−10.1
Low back pain (0, 1)	−0.094	−8.6	−0.117	−11.4
Headache (1–4)	−0.035	−4.6	−0.059	−10.1
Chest pain (0, 1)	−0.173	−7.4	−0.157	−7.4
Psycho-social problems:				
Coping problems (1–4)	−0.060	−5.0	−0.058	−5.7
Depression (1–4)	−0.043	−3.9	−0.042	−5.2
Sleeplessness (0, 1)	−0.043	−4.2	−0.032	−3.8
Lack of support (0, 1)	−0.032	−2.4	−0.072	−5.2
Loneliness (1–3)	−0.031	−3.2	−0.022	−2.7
Lifestyle:				
Leisure physical activity (1–4)	0.049	8.8	0.045	6.8
Smoking (0, 1)	−0.030	−3.4	0.014	1.3
Physiological measures:				
Heart rate	−0.002	−4.6	−0.001	−2.7
Relative body weight	−0.058	−4.0	−0.012	−1.1
Total R^2	0.208		0.242	

*$P < 0.05$ if $t > 1.96$, $P < 0.01$ if $t > 2.576$, $P < 0.001$ if $t > 3.29$.

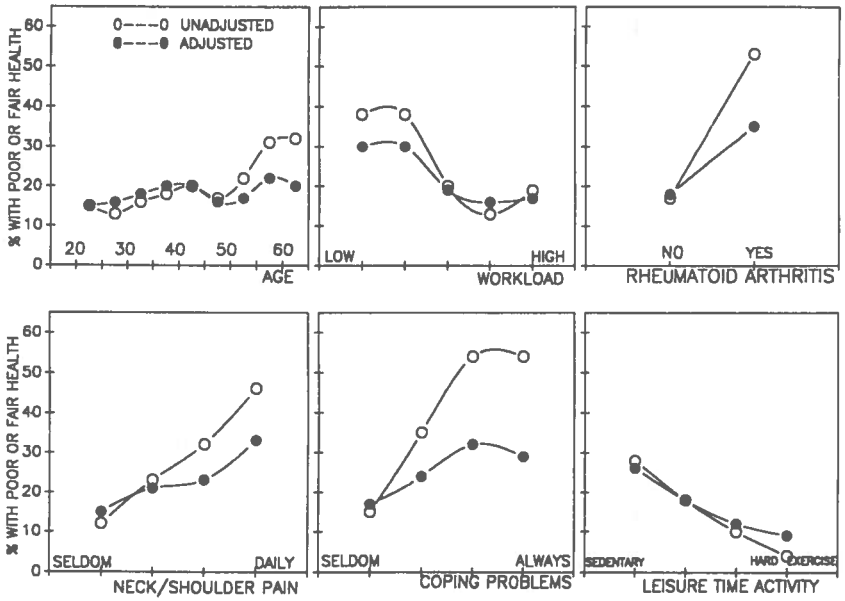

Fig. 1. The association between self-evaluated health and some selected variables in 6750 men aged 20–61 (unadjusted and adjusted for all other statistically independent variables by analysis of covariance). Tromsø 1986–87.

angina pectoris, migraine and cardiovascular risk score, however, did not show a significant independent impact.

Figures 1 and 2 show multiple classification analyses of perceived health according to age, workload, rheumatoid arthritis, neck/shoulder pain, coping problems and leisure time activities in men and women, respectively. The figures display both the crude associations and the associations adjusted for the other independent variables in Table 3. The increase in percentage of men and women with poor or fair perceived health was modest both in the

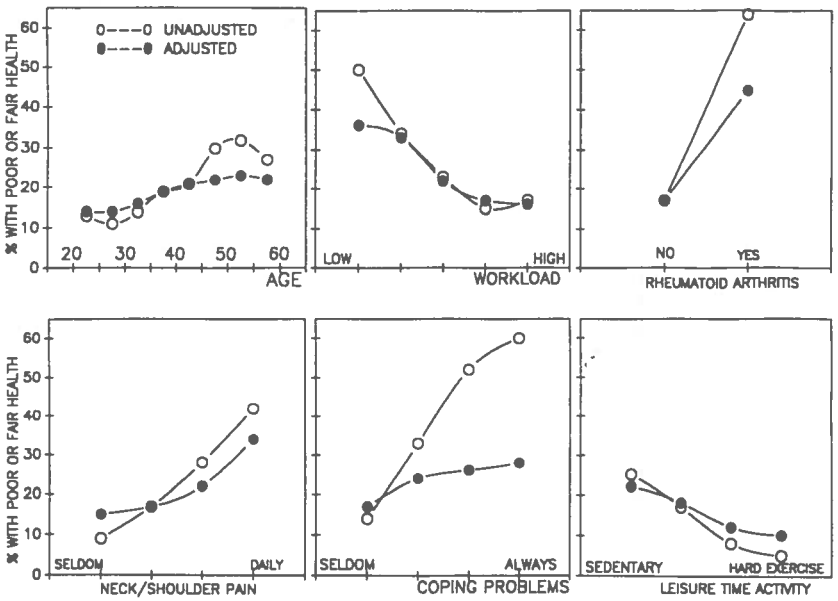

Fig. 2. The association between self-evaluated health and some selected variables in 7339 women aged 20–56 (unadjusted and adjusted for all other statistically independent variables by analysis of covariance). Tromsø 1986–87.

adjusted and unadjusted figures until the age of 40. Thereafter the unadjusted figures showed a marked increase until the middle of the fifties. In the adjusted figures the increase was modest also after the age of 40. The positive effect of leisure time activity and workload on perceived health was only moderately reduced by adjustment and almost linear, except for the positive influence of workload in men which corresponded to the change in employment from full time to part time or unemployed. The detrimental effect of having neck shoulder pain was almost linear over the frequency categories and marked also after adjustment. The bivariate effect of coping problems on the other hand was considerably reduced by adjustment for other independent variables. The single variable showing the greatest effect on self-evaluated health was rheumatoid arthritis. More than 60% of women and 50% of men having this disease reported reduced perceived health. Even after adjustment this was the independent variable showing the greatest absolute difference between extreme categories.

DISCUSSION

An advantage of this comprehensive population study is the possibility of analysing the relationship between self-evaluation of health and information on a wide range of indicators, i.e. social, physiological, behavioral and psychological. This, together with the high response rate and the high number of individuals studied, provide an excellent data base for assessing predictors of perceived health.

In the present study subjective health was measured by having the respondents rate their health along a five-step scale from very poor to excellent in a self-administered questionnaire. This measure has been frequently employed in sociomedical research, especially in studies of elderly populations. The validation problems related to this health measure are obvious. Most often so-called objective measurements, based on observations and or examinations by professionals, have been assumed to be an appropriate standard by which to evaluate self-ratings. Since important reliability problems are involved also in ratings done by professionals, this is a questionable assumption. As concluded by Ware [10], the strength of measures of general health perceptions lies in their subjectivity, and that these perceptions can be measured reliably even with very brief instruments. The fact that overall self-evaluation of health is found to predict mortality [1–4] indicates that this measure contains important information not detected by traditional clinical measures. Our finding of an almost nonexistent association between self-evaluated health and coronary risk profile, based on serum cholesterol, blood pressure and cigarette smoking, may add credibility to the hypothesis that this measure bears an independent risk of mortality [1].

Other studies have revealed the self-rating to be stable in time, even more stable than objective measures of health. It also seems to be a better predictor of future physician's rating than the reverse [15]. A study of a Norwegian population comprising our measure of health is a national health study based on personal interviews with a representative sample of the Norwegian population [16]. Findings revealed distributions of subjective health status according to age and sex very close to the present findings.

Our findings indicate that the individual's perception of somatic symptoms and disease connected to the musculo-skeletal system was the best predictor of self-evaluated health in either sex. With the exception of rheumatoid arthritis, these are categories of complaints with high prevalence in the population and in line with the fact that diseases of the musculo-skeletal system have been found to be the most frequent cause of sick-leave in Norway [17]. The principal predictor considered together with the direct and strong positive effect of leisure time activities and workload on perceived health suggests that a main dimension has to do with the individual's perception of physical performance and suffice in general. The complexity involved, however, is demonstrated by the direct effect of the psycho-social element on self-evaluation.

The mutual strength of the different predictors of perceived health in the present analysis may be somewhat obscure, depending on the prevalence of the symptom and disease or chosen perspective. In the multiple regression analyses symptoms yielded the highest explanatory power and strongest significance whereas in the multiple classification analyses rheumatoid arthritis had the greatest impact. This discrepancy reflects the variation in the independent variables where the few cases of rheumatoid arthritis only modestly contribute to the explanation of the total variation in perceived health but seriously affect the health of the individual.

Kaplan *et al.* suggested that subjective health is reduced when one gets involved with activities like taking remedies for diseases or become busy with physician consultations [3]. Our results support previous findings that treatment of hypertension might contribute to a decreased self-evaluated health [18]. Marked reduction in self-rated general health has been found after myocardial infarction [19]. Results revealed both myocardial infarction and angina pectoris to have no independent impact on self-rated health. When excluding motion chest pain and nitroglycerine medication, however, both conditions appeared as independent predictors in men, only angina pectoris in women. This may indicate that related symptoms or receiving medication have a more important impact on health perception than labelling alone.

Barsky reports that the North American society's fascination with health, besides having substantial benefits, has resulted in a more negative perceived health status [20]. Since the Norwegian society seems to compete well in the matter of fascination with health, a similar negative effect is likely to be seen in the Norwegian population. Our findings do not indicate an ongoing negative trend in perceived health between generations. Young adults were not found to be more sensitive to somatic symptoms and diseases compared to the oldest ones.

The historical medical tradition of a disease oriented conceptualization of health and illness seems to be in a process of change towards a more holistic concept. Our study suggests an existing discrepancy between the population's evaluation of health threats and the ability of the health care system to offer these

conditions effective treatment. This discrepancy may also explain the population's increasing expectation and demands towards the health care system, resulting in a constantly increasing consumption of health care. Paradoxically one might say that the population has adopted the expanded health concept disclosing the health care system's impotence of being able to fulfil it.

In general the benefit of 'intervention' to alter perceived health might be great. The single self-report item employed in this study seems to represent a subjective response of great value at least in the assessment of community needs calling for measures outside the health care system. An important role of the health care system might be to get involved with activities that possibly could increase the general health optimism of the population.

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DETERMINANTS AND DIMENSIONS INVOLVED IN SELF-EVALUATION OF HEALTH

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Abstract—This study explores mechanisms involved in self-evaluation of health by making specifications of linkages among various dimensions of health status, physiological measures, social and behavioral factors or characteristics. The proposed structural equation model is tested by using data from a comprehensive health survey of the population of Finnmark county, Norway (1987–88), including 4549 men and 4360 women aged 30–62. The findings suggest the burden of physical distress and reliance on permanent disablement benefit to play the key role in reducing self-evaluated health. The seemingly strong labelling impact of permanent work disability, contrasted the modest effect of diagnoses of chronic disease. Moreover, the impact of both these key factors and other important determinants is strongly socially patterned. Positive health related life-style appeared to have a positive impact on self-rated health, while preoccupation with health had a negative impact. This finding adds some credibility to the suggestion that the growing occupation and fascination with health have some negative health outcomes.

Key words—self-rated health, health status, structural equation model

INTRODUCTION

Health is widely accepted as a multidimensional concept, comprising both physical, psychological and social dimensions. Despite interesting developments in the past few decades concerning methods of measurement, there are divergent conceptualizations of the various dimensions [1–3]. In a review of the current state of art in health status measurement, Ware [1] suggests 6 dimensions: physical, mental, social, role, general health perceptions and symptoms. An important measure of general health is the individual's evaluation of own overall health status, frequently measured by a single-item with response along a 4- or 5-point scale from very poor to excellent. It has been suggested that this measure represents a summary of how various aspects of health are perceived by the individual. Further, that people experience symptoms and different health threats in a more global manner than disease oriented medical conceptions would suggest [4–6]. Besides a close relationship with symptoms and various objective measures of health, self-rated health has been found to be one of the best predictors of use of health care services [1, 6–8], in addition to being an independent predictor of survival [9–12]. Indicators of health promoting lifestyle (i.e. physical exercise) seem to have an independent positive effect on self-rated health [6, 13]. While its relation to gender and socio-economic status are conflicting, the findings suggest self-rated health to be an important intervening variable between objective health problems and life satisfaction [14, 15].

An interpretation of these results is that this measure tap a subjective state that has its own health consequences. Thus, a better understanding of causal mechanisms involved in self-evaluation of health might represent great potential benefits to health interventional practices. Although several researchers have proposed causal models of this kind of complex process [2, 16, 17], both modelling and measurement efforts have left much to be desired.

In a previous study from Norway [6] we found the individual's perception of somatic symptoms and disease connected to the musculo-skeletal system to be the best predictor of self-rated health. This might indicate a striking gap between conditions reducing subjective health and our ability to offer these conditions effective treatment through the health care system. Our overall suggestion was that an important dimension of self-rated health has to do with the individual's perception of physical performance and suffice in general. In order to further explore the mechanisms involved in self-evaluation of health, a linear structural equation model has been formulated [18]. This implies a set of several equations which are connected in a system. The crucial first step when using this technique is the theoretical statement about causal ordering or priorities among variables.

THE MODEL

In this study we propose a structural equation model of self-rated health. Our central premise is that health and illness have both biological and social determinants. Moreover, that changes in usual physical and psychological functioning need interpretation and may or may not have any impact on the perceived health status [19, 20]. How individuals judge their own health is shaped by the interpretation of

disease labels (or other kinds of signals from health professionals or other status definers) and physical and psychological symptoms. This interpretational process, however, depends on statuses and other background circumstances of the individual [3, 19].

Figure 1 presents the proposed model. All jointly dependent variables (the y-variables or endogenous variables) in the model are assumed to be directly affected by all the independent variables (x-variables or exogenous variables). For simplicity reasons the direct effect is illustrated by single arrows from the x-variables, each arrow representing the direct effects (gammas) on all the 7 jointly dependent variables. As shown in Fig. 1, only two effects of y-variables on other y-variables (betas) are fixed at zero, the effect between chronic disease ($y1$) and myocardial infarction risk score ($y3$) and the effect of $y3$ on physical distress ($y4$). The ζ's refer to the disturbance terms or error variables, representing the effect of unknown variables, the effect of known but omitted variables, the randomness of human behaviour and measurement error [18].

Table 1 contains the definitions of the variables entering the model. Our model integrates both physical, social and mental dimensions of health status. Measurements of disease and illness are represented by summative indexes of reported chronic diseases ($y1$), psychological distress ($y2$) and physical distress ($y4$). It should be noted that the various chronic diseases included are not reported physical symptoms, but rather medical conditions or diagnoses. The rationale behind including the myocardial infarction risk score ($y3$) is partly the assumption of negative effects on health evaluations due to the strong focus on cardiovascular risk factors, in particular cholesterol levels, the last 10–15 years. Ten years ago high risk individuals in our study population were informed about their risk profile and given health education, basically related to dietary habits, smoking and physical activity (high risk strategy). It may be argued that since myocardial infarction is included in the chronic disease index, our hypothesis of zero effects between $y1$ and $y3$ might be questionable. The assumption, however, is that an individual with infarction will mainly be concerned about his or her disease, reducing the importance of the risk profile.

In Norway disablement benefit ($y5$) *per se* has both physical, social and mental determinants. The assumption is that when physicians (and bureaucrats) are handling requests for disablement benefit, the medical information will have to be related to information on the social situation of the individual, like work situation and future possibilities at the labour market [21].

Our main hypothesis regarding the process of self-evaluation of health is that physical distress, disablement benefit and preoccupation with health ($y6$) are important intervening variables. We assume our measure of preoccupation with health to tap dimensions related to the phenomenon of the population's growing occupation and fascination with health, and our hypothesis is that of a negative effect on self-rated health.

Gender and age are important factors producing differences in disease and health status. The rationale

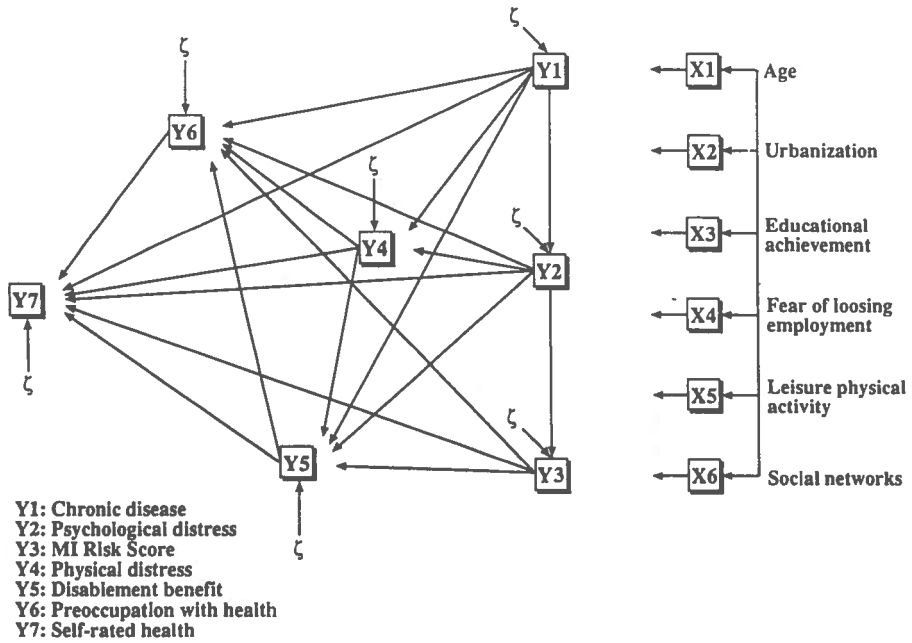

Fig. 1. The proposed model.

Table 1. Independent and dependent variables in the model

Variables	Descriptions
$x1$	*Age*: in years (30–62).
$x2$	*Urban*: population of the municipality (1–3): less than 2000, 2000–, 4000–14000.
$x3$	*Years of schooling*.
$x4$	*Fear of losing employment*: risk the coming years due to closing down, reductions or other reasons, No, yes (0, 1): Yes stated by 16.8% (men) and 10.1% (women).
$x5$	*Leisure physical activities*: sedentary, moderate, keep fit exercise, athletes (1–4).
$x6$	*Social networks*: exchange services with neighbours, index (0–8).
$y1$	*Chronic disease*: myocardial infarction, Angina pectoris, Diabetes, Psoriasis, Asthma, Bronchitis, Ulcus of stomach or duodenum, Rheumatoid arthritis, Cancer and Migraine, Epilepsy: all coded (0, 1) and added to an index (0–5).
$y2$	*Psychological distress*: index (0–2) based on depression (0, 1) and sleeplessness (0, 1).
$y3$	*Myocardial Infarction Risk Score*: based on serum cholesterol, systolic blood pressure and cigarettes currently smoked per day.
$y4$	*Physical distress* (pain): low back pain, Chest pain when walking steps, Pain from upper part of stomach, heartburn, Pain from joints: all coded (0, 1) and added to an index (0–5).
$y5$	*Disablement benefit* (DB, 0–2): 1 = receive DB and had a part-time job last year, 2 = receive DB and no paid employment last year (full or partial permanent work disability reported by a total of 13.2% and 19.4% in men and women respectively).
$y6$	*Preoccupation with health*: talked to family members (0, 1) or friends (0, 1) about health matters the last 2 weeks (0–2).
$y7$	*Self-rated health*: in general, how would you say your health is? Poor, fair, good, very good (1–4).

behind including the level of urbanization of the society ($x2$) and years of education ($x3$) is that these variables are assumed to be indicators both of differences in living conditions, social status and cultural variation [22]. Fear of losing employment ($x4$) is assumed to measure the burden of economical and social insecurity due to ongoing structural changes in the society. The County of Finnmark had been facing economical depression for some few years prior to the survey, explaining the high proportion of the population reporting fear of losing employment, 16.8% and 10.1% in men and women respectively. The inclusion of leisure physical activity—$x5$ (assumed to be an important indicator of health related life-style) and social network—$x6$ is based on strong indications from previous findings of substantial effects on health–illness indicators.

MATERIALS

Data for this study stem from the 1987/88 Finnmark population survey. Finnmark is the northernmost Norwegian county with a population of about 74000 inhabitants. The first and second Finnmark survey (Finnmark I and II) were carried out in 1974–75 and 1977–78 respectively [23–25]. From May 1987 to June 1988 the following population groups were invited to the third Finnmark survey: all residents aged 40–62, all residents aged 30–39 invited to Finnmark II, and a 10% random sample of the persons aged 20–39 not invited to Finnmark II.

The main components of the survey were (1) measurements of weight, height, blood pressure and serum lipids and (2) three self-administered questionnaires. Systolic and diastolic blood pressure were measured by an automatic device (DINAMAP, Criticon, Tampa, U.S.A.), which measured the blood pressure by an oscillometric method and calculated the mean arterial pressure automatically. Three recordings were made at 1-min intervals. Except for the introduction of a third questionnaire, the study was carried out in a manner practically identical to that of the second study.

Questionnaire I (enclosed in the letter of invitation) comprised questions on cardiovascular diseases and related symptoms, leisure physical activities, type of work, ethnic origin, smoking habits and consumption of salt, fats and coffee. Information on self-rated health, chronic diseases, perception of symptoms, family history of chronic diseases, food and alcohol habits—and years of education were obtained from Questionnaire II presented at the examination and completed at home. No reminder was distributed to the non-responders.

Three weeks after the termination of the whole screening Questionnaire III was sent to all persons originally invited to the screening. It included questions on use and opinions of health care services, use of drugs, conditions of work, migrational prospects, well-being, social networks, household characteristics, health related behaviour and outdoor life. A reminder was distributed to the non-responders of the third questionnaire.

The total number of individuals attending the screening were 9043 men and 8823 women. Of the eligible population, when excluding a total of 1833 individuals reported being dead, moved or temporarily absent, the attendance rate was 81.0% in men and 88.2% in women. The lowest attendance rate was found among the youngest (20–29 years) and the unmarried.

All attenders filled in Questionnaire I, and the response rate to Questionnaire II and III was 72.9 and 78.5% respectively. Table 2 gives the eligible population, attendance rate and response rate to all questionnaires according to sex, age, marital status and geographical region. The analyses presented in this article are based on information from both the screening and all three questionnaires. Among those who attended the screening 61.3 and 62.3% in men and women, respectively, filled in all the three questionnaires, with a higher response in the oldest age-group and among married. One geographical region contrasted the other regions with a 10% lower response rate.

Table 2. Response rate (%) to questionnaire (Q) 3 and to all questionnaires (those who filled in all three questionnaires) among attenders of the screening. Rates are given according to sex, age-group, marital state and geographical region. The Finnmark Study 1987–88

	Eligible population*		Attendance rate		Response to all Q's	
Rate	Men	Women	Men	Women	Men	Women
All	11132	9977	81.0	88.2	61.3	62.3
Age						
20–29	508	496	54.7	70.2	57.6	59.2
30–39	1688	1540	74.3	86.2	60.7	61.1
40–49	4469	3845	82.4	89.1	59.9	59.7
50–62	4467	4096	85.2	90.4	63.1	65.4
Marital state						
Married	6976	7052	88.1	91.5	62.4	63.2
Unmarried	4156	2925	69.2	80.3	58.9	59.8
Region						
Fishery	2675	2338	81.3	88.7	60.1	62.4
Fjord	1265	1041	81.9	89.7	50.7	50.6
Inland	1565	1293	80.3	89.0	60.1	62.0
Town	5627	5305	80.9	87.6	64.6	64.7

*After excluding 1833 individuals reported being dead, moved or temporarily absent.

Comparative analyses on a wide range of characteristics of non-responders versus responders of the questionnaires were carried out in order to judge possible selection biases caused by non-response. These comparisons showed that non-responders differ from the responders in a number of respects. The differences, however, were minor in magnitude except for the higher proportion of smokers (57 vs 50% in men and 50 vs 43% in women), of high physical activity at work (67 vs 62% in men only) and myocardial infarction risk score (60.6 vs 51.9% in men and 10.4 vs 9.0% in women) in non-responders vs responders. A crucial question related to the analyses in this paper has to do with the possibility of distortion of associations. Comparing the results of multiple regression analyses by including and excluding the non-responders respectively, these distortions were not of sufficient magnitude to substantially bias the estimates of parameters. Given the very high non-attendance in age-group 20–29 not attending the screening, however, the decision was made to exclude this age-group from the analyses. Thus, after excluding cases with missing data and age-group 20–29, a total of 4549 men and 4360 women represented the effective material.

STATISTICAL ANALYSES

When variables are all ordinal or of mixed scale types, the use of product moment correlations based on raw scores are not recommended. Instead, polychoric or polyserial correlation coefficients should be used [23, 26]. Based on the polychoric and polyserial correlation matrix of the model variables, parameters were estimated by employing the Lisrel, submodel 2 (causal models for directly observed variables, Lisrel VI within SPSS-X). We assume the disturbance terms to be unrelated to each other and to the x-variables. The estimates appeared unaffected by the estimation method, i.e. unweighted least squares compared to maximum likelihood. Standardized values of parameters were estimated for men and women separately, i.e. we are not making estimates of the magnitude of the gender effects. Sex specific zero-order correlations and estimates of direct and total effects are given. Total effects are the sum of direct and indirect effects and reflect the amount of change in a variable that is induced by a given unit (standard deviation) change in an antecedent variable under the given model, regardless of the particular intervening mechanisms through which these changes occur [27]. Indirect effects are components of the total effect of a variable that are mediated by variables specified by the model as intervening between the causal variable and the dependent variable of interest.

Some stratified and supplementary analyses were performed. First, coefficients within 10-year age-groups were estimated in order to uncover possible age-specific patterns of the process under investigation. Second, replication of analyses were

Table 3. Distribution (%) of subjects according to self-rated health status and age in 6291 men and 6096 women aged 20–62. Finnmark 1987–88

	Men				Women			
Age	Poor	Fair	Good	Excellent	Poor	Fair	Good	Excellent
30–34	1.0	11.6	57.4	30.0	1.5	9.1	58.6	30.8
35–39	2.1	14.5	56.6	26.9	2.2	14.2	58.8	24.9
40–44	2.0	15.3	61.7	21.1	1.9	18.3	62.0	17.8
45–49	3.2	17.1	59.1	20.6	3.6	20.6	59.8	16.0
50–54	3.4	24.1	57.4	15.1	4.9	29.4	51.6	14.0
55–59	6.7	31.2	51.3	10.8	5.7	34.0	51.0	9.4
60–62	7.0	31.8	51.8	9.3	6.6	35.3	49.8	8.3
Total	3.8	21.4	56.9	17.9	3.9	24.3	56.1	15.7

performed after having excluded individuals receiving disablement benefit. Finally, global life satisfaction (Do you in general like the way things are? Not at all, not so much, more or less, very much) was included as the ultimate dependent variable of the model.

RESULTS

Table 3 shows the distribution of self-rated health by age in men and women separately. Subjective health deteriorated markedly with increasing age in both sexes. The most marked deterioration appeared at age 50–54 in women and 5 years later in men. Between the sexes only moderate differences were revealed except for age-group 50–54, where women judged their general health to be markedly lower than men.

The zero-order correlations between variables entering the model, for men and women separately, are given in Table 4. Table 5 (men) and Table 6 (women) show the estimates of direct and total effects of the model. Most of the predictions, with some exceptions, of the direct effects were supported by the empirical findings in both men and women (significant at the 0.05 level). In addition, direct effects not reaching the level of significance in men appeared low in magnitude in women. Two exceptions were the effect of age on psychological distress and level of urbanization on disablement benefit.

The assessment of the extent to which the proposed model fitted the data the χ^2 distribution was used. With 2 degrees of freedom, the probability was greater than 0.05 in men, indicating an acceptable fit or that the restrictions of the model, i.e. effects fixed at zero, are supported. In women, however, an acceptable fit was reached after removing the restriction of an effect of myocardial infarction risk score on physical distress.

Considering the magnitude of the direct, indirect and total effects, two overall observations are apparent from the estimates in Tables 5 and 6. First, among the independent variables both years of education and fear of loosing employment was found to have appreciable direct or indirect effects on self-rated health. Second, physical distress and disablement benefit appeared as the main mediating factors producing variation in self-rated health in both sexes.

As seen from the estimates, all dependent variables, except for psychological distress, are effected by educational achievement. With increasing years of schooling both chronic disease, myocardial infarction risk score and physical distress are reduced. Moreover, this variable appeared to have the largest direct effect on disablement benefit (except for fear of losing employment) and preoccupation with health, whereas the direct effect on self-rated health was found to be negative. The importance of considering both direct and indirect effects are clearly demonstrated when interpreting the effect of years of schooling on self-rated health. Although the estimated total effect on

Table 4. Zero-order correlations[1] between variables entering the model for 4658 men (below the diagonal) and 4308 women (above the diagonal)

Variable	Correlation with												
	(x1)	(x2)	(x3)	(x4)	(x5)	(x6)	(y1)	(y2)	(y3)	(y4)	(y5)	(y6)	(y7)
Age (x1)	—	−0.011	−0.437	−0.116	0.014	−0.238	0.125	0.135	0.434	0.156	0.519	−0.038	−0.259
Urban (x2)	−0.043	—	0.163	−0.198	−0.013	−0.042	−0.036	−0.026	−0.059	−0.029	−0.002	0.067	0.035
Years of schooling (x3)	−0.397	0.193	—	−0.107	0.043	0.194	−0.126	−0.123	−0.311	−0.179	−0.519	0.180	0.301
Fear of losing employment (x4)	−0.073	−0.188	−0.198	—	0.007	0.077	0.031	0.097	0.005	0.002	−0.341	0.055	−0.004
Leisure physical activity (x5)	−0.066	0.039	0.104	−0.081	—	0.098	−0.058	−0.081	−0.050	−0.080	−0.119	0.049	0.202
Social networks (x6)	−0.196	−0.000	0.156	0.062	0.118	—	−0.017	−0.091	−0.093	−0.051	−0.254	0.245	0.155
Chronic disease (y1)	0.210	−0.043	−0.158	0.037	−0.096	−0.056	—	0.259	0.051	0.412	0.372	0.047	−0.374
Psychological distress (y2)	0.026	−0.007	−0.060	0.151	−0.092	−0.066	0.271	—	0.092	0.416	0.369	0.051	−0.447
MI risk score (y3)	0.232	−0.078	−0.197	0.034	−0.141	−0.056	0.055	0.064	—	0.114	0.249	−0.065	−0.186
Physical distress (pain) (y4)	0.117	−0.048	−0.210	0.152	−0.081	−0.007	0.423	0.394	0.059	—	0.424	0.121	−0.569
Disablement benefit (y5)	0.521	−0.124	−0.485	−0.321	−0.084	−0.196	0.454	0.335	0.151	0.408	—	−0.033	−0.608
Preoccupation with health (y6)	0.023	0.105	0.158	0.011	0.073	0.189	0.079	0.046	−0.044	0.113	0.001	—	−0.051
Self-rated health (y7)	−0.248	0.078	0.277	−0.116	0.237	0.117	−0.405	−0.403	−0.177	−0.537	−0.570	−0.082	—

[1]Polychoric (when a pair of variables are ordinal) and polyserial (one ordinal and the other continuous) correlation coefficients are estimated when the ordinal variable in a pair of variables have number of values less or equal to 8.

Table 5. Estimates of direct effects and total effects (in italics) of the model in 4549 men. Standardized solution

Variables	Variables												
	*x*1	*x*2	*x*3	*x*4	*x*5	*x*6	*y*1	*y*2	*y*3	*y*4	*y*5	*y*6	R^2
*y*1	0.178	−0.013*	−0.071	0.028*	−0.074	−0.003*							0.058
	—	—	—	—	—	—							
*y*2	−0.030*	0.046	0.006*	0.148	−0.051	−0.061	0.266						0.102
	0.017	0.042	−0.013	0.156	−0.071	−0.062	0.266						
*y*3	0.183	−0.046	−0.103	0.001*	−0.113	0.012*	—	0.043					0.084
	0.183	−0.044	−0.104	0.008	−0.116	0.009	0.012	0.043					
*y*4	0.002*	−0.003*	−0.135	0.066	−0.010*	0.048	0.322	0.291	—				0.290
	0.064	−0.011	−0.162	0.121	−0.054	0.029	0.399	0.291					
*y*5	0.264	−0.116	−0.362	−0.465	0.004*	−0.030	0.208	0.248	−0.015*	0.181			0.732
	0.315	−0.106	−0.408	−0.399	−0.045	−0.041	0.346	0.300	−0.015	0.181			
*y*6	0.103	0.097	0.230	0.091	0.053	0.179	0.031*	−0.019*	−0.021*	0.105	0.090		0.102
	0.139	0.088	0.177	0.065	0.045	0.179	0.099	−0.038	−0.022	0.121	0.090		
*y*7	0.067	−0.045	−0.126	−0.287	0.146	0.028	−0.017*	−0.044	−0.081	−0.231	−0.617	−0.047	0.535
	−0.167	0.016	0.165	−0.079	0.197	0.040	−0.340	−0.302	−0.070	−0.348	−0.621	−0.047	

Total coefficient of determination for structural equations = 0.752.
χ^2 with 2 df = 3.36, P = 0.186.
Direct effects: All estimates are standardized and are significant at the 0.05 level except those marked by *.

*x*1: Age.
*x*2: Urban.
*x*3: Years of schooling.
*x*4: Fear of loosing employment.
*x*5: Leisure physical activity.
*x*6: Social networks.

*y*1: Chronic disease.
*y*2: Psychological distress.
*y*3: MI risk score.
*y*4: Physical distress (pain).
*y*5: Disablement benefit.
*y*6: Preoccupation with health.
*y*7: Self-rated health.

self-rated health was clearly positive, the direct effect appeared as negative. This is due to several positive indirect effects, in particular the effect mediated through disablement benefit. Fear of unemployment was mainly found to increase psychological distress and to reduce self-rated health. The total effect on self-rated health, however, appeared small due to the fact that an important part of the effect of this variable operates indirectly via disablement benefit.

The hypothesized positive effect of leisure physical activity and social networks on self-rated health was supported by the empirical findings. The effect of level of urbanization appeared to be different in men and women. A predicted negative effect on disablement benefit was found in men only, while a positive effect on preoccupation with health appeared in both sexes. Most of the effects of age seem plausible: increasing chronic disease, myocardial infarction risk and disablement benefit. Considering the effect of age on self-rated health, the estimated total effect was negative. The estimated direct effect, however, was positive due to the fact that most of the indirect effects are negative. Again we see that disablement benefit operates as the most important transmitter of effects.

Self-rated health was both directly as well as indirectly affected by all the introduced dependent variables, except for preoccupation with health in

Table 6. Estimates of direct effects and total effects (in italics) of the model in 4360 women. Standardized solution

Variables	Variables												
	*x*1	*x*2	*x*3	*x*4	*x*5	*x*6	*y*1	*y*2	*y*3	*y*4	*y*5	*y*6	R^2
*y*1	0.101	−0.016*	−0.078	0.029*	−0.059	0.025*							0.027
	—	—	—	—	—	—							
*y*2	−0.091	0.006*	−0.028*	0.104	−0.062	−0.062	0.236						0.098
	0.115	0.002	−0.047	0.111	−0.076	−0.056	0.236						
*y*3	0.381	0.026*	−0.139	0.026*	−0.051	0.029	—	0.019*					0.211
	0.383	−0.025	−0.139	0.028	−0.053	0.027	0.005	0.019					
*y*4	0.020*	−0.003*	−0.088	−0.048	−0.032	0.015*	0.313	0.322	0.032				0.287
	0.100	−0.008	−0.132	−0.002	−0.077	0.005	0.390	0.322	0.032				
*y*5	0.232	−0.001*	−0.373	−0.375	−0.059	−0.064	0.188	0.209	−0.024	0.152			0.671
	0.282	−0.004	−0.414	−0.348	−0.096	−0.070	0.296	0.257	−0.016	0.152			
*y*6	0.070	0.066	0.241	0.139	0.036	0.239	−0.025*	−0.009*	−0.034	0.133	0.129		0.125
	0.104	0.065	0.177	0.081	0.017	0.230	0.062	0.067	−0.031	0.153	0.129		
*y*7	0.054	−0.002*	−0.049	−0.168	0.105	0.025	−0.032	−0.108	−0.045	−0.294	−0.513	−0.019*	0.546
	−0.155	0.003	0.212	−0.005	0.189	0.059	−0.325	−0.337	0.046	- 0.374	−0.515	−0.019	

Total coefficient of determination for structural equations = 0.709.
χ^2 with 1 df = 3.10, P = 0.08.
Direct effects: all estimates are standardized and are significant at the 0.05 level except those marked by *.

*x*1: Age.
*x*2: Urban.
*x*3: Years of schooling.
*x*4: Fear of losing employment.
*x*5: Leisure physical activity.
*x*6: Social networks.

*y*1: Chronic disease.
*y*2: Psychological distress.
*y*3: MI risk score.
*y*4: Physical distress (pain).
*y*5: Disablement benefit.
*y*6: Preoccupation with health.
*y*7: Self-rated health.

women. In both sexes disablement benefit had the largest total effect on self-rated health, whereas the total effect of chronic disease, psychological distress and physical distress were comparable in magnitude. The pattern of the intervening mechanisms of the various health status measures was interesting. First, the direct effect of both chronic disease and psychological distress was found small in magnitude, and that the substantial part of the effects of these measures operate indirectly via physical distress and disablement benefit.

The predicted negative effect of preoccupation with health on self-rated health was supported by empirical findings in men. The magnitude of the effect, however, was relatively modest. Educational achievement and social network appeared to have the largest effect on preoccupation with health.

Stratified and supplementary analyses

The same pattern of overall interrelationship among the variables appeared when the estimates of coefficients were made within 10-year age-groups (results not given). Comparisons based on the standardized values of estimates, however, indicated both disablement benefit, fear of losing employment and educational achievement to have a stronger negative direct effect on self-rated health in the two youngest age-groups compared to the oldest. In addition the effect of preoccupation with health on self-evaluated health appeared positive (0.107) among women aged 30–39.

In order to have estimates restricted to individuals not being exposed to the work disablement role, all analyses were repeated after excluding individuals receiving disablement benefit from the material. The interrelationship among the dependent variables appeared relatively the same, except for a stronger impact of psychological distress on self-evaluated health. In both men and women the hypothesized negative effect of preoccupation with health on self-rated health was supported by empirical findings (0.064 and 0.032). The direct effect of educational achievement on self-rated health was estimated to be positive in both men and women. Finally, fear of unemployment appeared mainly to effect psychological distress and to have only a minor effect on self-rated health.

A final supplementary analysis was to include global life satisfaction as the ultimate dependent variable of the model. Psychological distress was found to have the largest direct effect on life satisfaction (-0.322 in men and -0.327 in women), whereas the positive effect of self-rated health was estimated to be 0.190 and 0.149 in men and women respectively. The effects of other dependent variables were low. Among the independent variables fear of unemployment was found to have a direct negative effect on life satisfaction (-0.218 in men and -0.119 in women).

DISCUSSION

In the present study a structural equation model was proposed to explore mechanisms involved in global self-evaluation of health. The model integrates various dimensions of health status and assumes links between somatic, psychological and physiological measures, and social and behavioral characteristics. The findings suggest physical distress, measured as symptoms of pain from various parts of the body, and the work disablement role to play the key role in reducing self-evaluated health. Moreover, the impact of both these key factors is strongly socially patterned. Seen together with two other important determinants, fear of unemployment and physical activity, we may suggest that the important dimension reflected by global self-evaluated health is the overall interpretation of own suffice in general, of how people handle the various stressors and the 'pain in life'.

The empirical basis for a structural model of this kind might be shaky, suggesting that the question of plausibility represents a major challenge. Although complex, our model obviously represents an oversimplification. Still we judge the plausibility of most specifications to be fairly strong, the theoretical argument underlying the specification of only recursive effects is weak. A more appropriate assumption might be to specify reciprocal effects among some of the measures of health status, in particular between psychological and physical distress.

An important theoretical consideration is that the various dimensions of health status should be identified and treated as distinct entities [1, 2]. The introduced measures in the present analyses are judged to cover most of the dimensions postulated by other authors [1]. Since errors of measurement might bias the estimates, however, the assumption that all variables are measured without measurement error is questionable. A better strategy might have been to employ a measurement model, where the various dimensions were considered as latent variables reflected by their specified indicators. Estimation of reliability components in cross-sectional research designs, however, are plagued with problems of interpretation [27].

It should be noted that the massive amount of information available concerning those defined as non-responders of this study, gives an excellent opportunity to address the problem of possible selection bias caused by non-response. Non-responders were found to differ from the responders in various respects in accordance with other studies [28, 29]. The magnitude of these differences, however, appeared surprisingly low. This, together with analyses on how the exclusion of non-responders influenced the relationships between selected variables, suggest the selection biases in our material to have no important impact on our estimates of the parameters.

The impact on self-rated health of most of the prior variables are low or modest. When considering the

magnitude of direct and indirect effects, the role of physical distress and disablement benefit in the determination of self-rated health provides an important focal point in the interpretation of the process involved. Interesting is the role physical distress seems to play both independently, indicated by the direct effect, and as an important transmitter of effects. First, these findings support a previous suggestion that the level of physical symptom experience play a more crucial role in reducing self-rated health than the labelling associated with diagnoses of chronic disease [6]. As stated by Mechanic [30], however, physical symptoms reflect both physical illness or diseases, psychological state, situational stressors and prior learning. A careful examination of the various indirect effects appearing in the present analyses, gives support to these suggestions. Further, the role of physical symptom experience might be that of a 'medium', i.e. being an important reflection of how people handle serious stressors and the 'pain in life'.

It is noteworthy that the effect of labelling associated with chronic disease contrasted very strongly with that of permanent work disablement. Two interesting observations should be noted concerning the role played by disablement benefit in the determination of self-rated health. First, a substantial part of the effect of educational achievement operates indirectly via disablement benefit. Second, disablement benefit, independent of prior variables, provides a very strong direct influence on self-rated health. These findings give support to the stated theoretical considerations of self-rated health being linked to life situations or stratificational processes [3, 19]. Length of schooling is often seen as the most important factor producing differences in status attainment. The strong direct negative effect of educational achievement on disablement benefit appearing in present analyses support the previous finding that the chance of receiving disablement benefit in Norway strongly reflects variation in conditions of living [21]. It should further be noted that a low level of education tends to associate both with higher exposition to physically demanding jobs and reduced possibilities at the labour market. These two forces working together seem obviously to have an important impact on the classification mechanisms involved in this kind of permanent work disability. The very strong direct negative effect on self-rated health might indicate that the work disablement role sets off a specific process of adaptation. Wadel [31] found that people being exposed to permanent unemployment will try to legitimate their situation by means of presenting or defending what is specific of their destiny. Stressing the sick role might act as an effective way to justify the work disablement role. This possible explanation should, however, not be isolated from the theory of the fundamental role work plays in the life of man.

Unemployment *per se* is found to represent a serious stressor with negative health outcomes [20, 32–33]. In a society with unemployment as a minor problem in an international perspective, but with a rising economic depression, fear of unemployment might represent a similar serious stressor. The assumed negative effect of fear of losing employment on self-rated health was supported by the empirical findings. An interesting finding was that disablement benefit played an important role as transmitter of effect on self-rated health, i.e. the negative direct effect increased most probably due to the fact that receiving disablement benefit *per se* gives full or partly economic security.

A phenomenon reported from highly industrialized societies in the last 10 years is the population's growing occupation and fascination with health [34–35]. This kind of new 'ism', 'healthism', might reflect an ongoing change in the population's perception of illness and concepts of health. Besides having obvious health benefits, it has been suggested that it might result in substantial negative effects on health-illness evaluations [34]. Our finding of a negative, although weak, direct effect of preoccupation with health on self-rated health, adds some credibility to this hypothesis. The validity questions involved in measuring the phenomenon of healthism, however, need to be more seriously addressed in future studies. Our assumption is that preoccupation or fascination with health will be positively related to health related behaviour. The best determinant of the employed measure of preoccupation with health appeared to be educational achievement, i.e. the more educated, the more occupied with health. Together with positive effects of both physical activity and urbanization, this measure appears to tap positive health life-style dimensions. The mechanisms involved, however, are complex. Future investigations should therefore in particular consider the suggested phenomenon together with introspectiveness as personal inclination found to affect the perception of threat, coping and the illness experience [36].

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PAPER II

DETERMINANTS AND DIMENSIONS INVOLVED IN SELF-EVALUATION OF HEALTH

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Short title: THE PROCESS OF SELF-EVALUATION OF HEALTH

ABSTRACT

This study explores mechanisms involved in self-evaluation of health by making specifications of linkages among various dimensions of health status, physiological measures, social and behavioral factors or characteristics. The proposed structural equation model is tested by using data from a comprehensive health survey of the population of Finnmark county, Norway (1987-88), including 4549 men and 4360 women aged 30-62. The findings suggest the burden of physical distress and reliance on permanent disablement benefit to play the key role in reducing self-evaluated health. The seemingly strong labelling impact of permanent work disability, contrasted the modest effect of diagnoses of chronic disease. Moreover, the impact of both these key factors and other important determinants is strongly socially patterned. Positive health related life-style appeared to have a positive impact on self-rated health, while preoccupation with health had a negative impact. This finding adds some credibility to the suggestion that the growing occupation and fascination with health have some negative health outcomes.

Key words: Self-rated health, health status, structural equation model.

INTRODUCTION

Health is widely accepted as a multidimensional concept, comprising both physical, psychological and social dimensions. Despite interesting developments in the past few decades concerning methods of measurement, there are divergent conceptualizations of the various dimensions (1-3). In a review of the current state of art in health status measurement, Ware (1) suggests six dimensions: physical, mental, social, role, general health perceptions, and symptoms. An important measure of general health is the individual's evaluation of own overall health status, frequently measured by a single-item with response along a 4- or 5-point scale from very poor to excellent. It has been suggested that this measure represents a summary of how various aspects of health are perceived by the individual. Further, that people experience symptoms and different health threats in a more global manner than disease oriented medical conceptions would suggest (4-6). Besides a close relationship with symptoms and various objective measures of health, self-rated health has been found to be one of the best predictors of use of health care services (1, 6-8), in addition to being an independent predictor of survival (9-12). Indicators of health promoting lifestyle (i.e. physical exercise) seem to have an independent positive effect on self-rated health (6, 13). While its relation to gender and socioeconomic status are conflicting, the findings suggest self-rated health to be an important intervening variable between objective health

problems and life satisfaction (14-15).

An interpretation of these results is that this measure tap a subjective state that has its own health consequences. Thus, a better understanding of causal mechanisms involved in self-evaluation of health might represent great potential benefits to health interventional practices. Although several researchers have proposed causal models of this kind of complex process (2,16-17), both modelling and measurement efforts have left much to be desired.

In a previous study from Norway (6) we found the individual's perception of somatic symptoms and disease connected to the musculo-skeletal system to be the best predictor of self-rated health. This might indicate a striking gap between conditions reducing subjective health and our ability to offer these conditions effective treatment through the health care system. Our overall suggestion was that an important dimension of self-rated health has to do with the individual's perception of physical performance and suffice in general. In order to further explore the mechanisms involved in self-evaluation of health, a linear structural equation model has been formulated (23). This implies a set of several equations which are connected in a system. The crucial first step when using this technique is the theoretical statement about causal ordering or priorities among variables.

THE MODEL

In this study we propose a structural equation model of self-rated health. Our central premise is that health and illness have both biological and social determinants. Moreover, that changes in usual physical and psychological functioning need interpretation and may or may not have any impact on the perceived health status (18-19). How individuals judge their own health is shaped by the interpretation of disease labels (or other kinds of signals from health professionals or other status definers) and physical and psychological symptoms. This interpretational process, however, depend on statuses and other background circumstances of the individual (3, 18).

Figure 1 presents the proposed model. All jointly dependent variables (the y-variables or endogenous variables) in the model are assumed to be directly affected by all the independent variables (x-variables or exogenous variables). For simplicity reasons the direct effect is illustrated by single arrows from the x-variables, each arrow representing the direct effects (gammas) on all the 7 jointly dependent variables. As shown in Figure 1, only two effects of y-variables on other y-variables (betas) are fixed at zero, the effect between chronic disease (y1) and myocardial infarction risk score (y3) and the effect of y3 on physical distress (y4). The ζ's refer to the disturbance terms or error variables, representing the effect of unknown variables, the effect of known but omitted variables, the randomness of human

behaviour and measurement error (23).

Table 1 contains the definitions of the variables entering the model. Our model integrates both physical, social and mental dimensions of health status. Measurements of disease and illness are represented by summative indexes of reported chronic diseases (y1), psychological distress (y2) and physical distress(y4). It should be noted that the various chronic diseases included are not reported physical symptoms, but rather medical conditions or diagnoses. The rationale behind including the myocardial infarction risk score (y3) is partly the assumption of negative effects on health evaluations due to the strong focus on cardiovascular risk factors, in particular cholesterol levels, the last 10-15 years. Ten years ago high risk individuals in our study population were informed about their risk profile and given health education, basically related to dietary habits, smoking and physical activity (high risk strategy). It may be argued that since myocardial infarction is included in the chronic disease index, our hypothesis of zero effects between y1 and y3 might be questionable. The assumption, however, is that an individual with infarction will mainly be concerned about his or her disease, reducing the importance of the risk profile.

In Norway disablement benefit (y5) per se has both physical, social and mental determinants. The assumption is that when physicians (and bureaucrats) are handling requests for

disablement benefit, the medical information will have to be related to information on the social situation of the individual, like work situation and future possibilities at the labour market (24).

Our main hypothesis regarding the process of self-evaluation of health is that physical distress, disablement benefit and preoccupation with health (y6) are important intervening variables. We assume our measure of preoccupation with health to tap dimensions related to the phenomenon of the population's growing occupation and fascination with health, and our hypothesis is that of a negative effect on self-rated health.

Gender and age are important factors producing differences in disease and health status. The rationale behind including the level of urbanization of the society (x2) and years of education (x3) is that these variables are assumed to be indicators both of differences in living conditions, social status and cultural variation (25). Fear of losing employment (x4) is assumed to measure the burden of economical and social insecurity due to ongoing structural changes in the society. The county of Finnmark had been facing economical depression for some few years prior to the survey, explaining the high proportion of the population reporting fear of losing employment, 16.8 % and 10.1 % in men and women respectively. The inclusion of leisure physical activity - x5 (assumed to be an important indicator of health related life-style) and

social network - x6 is based on strong indications from previous findings of substantial effects on health-illness indicators.

MATERIALS

Data for this study stem from the 1987/88 Finnmark population survey. Finnmark is the northernmost Norwegian county with a population of about 74000 inhabitants. The first and second Finnmark survey (Finnmark I and II) were carried out in 1974-75 and 1977-78 respectively (20-22). From May 1987 to June 1988 the following population groups were invited to the third Finnmark survey: All residents aged 40-62, all residents aged 30-39 invited to Finnmark II, and a 10 per cent random sample of the persons aged 20-39 not invited to Finnmark II.

The main components of the survey were 1)measurements of weight, height, blood pressure and serum lipids and 2)three self-administered questionnaires.
Systolic and diastolic blood pressure were measured by an automatic device (DINAMAP, Criticon, Tampa, USA), which measured the blood pressure by an oscillometric method and calculated the mean arterial pressure automatically. Three recordings were made at one-minute intervals. Except for the introduction of a third questionnaire, the study was carried out in a manner practically identical to that of the second study.

Questionnaire I (enclosed in the letter of invitation) comprised questions on cardiovascular diseases and related symptoms, leisure physical activities, type of work, ethnic origin, smoking habits and consumption of salt, fats and coffee. Information on self-rated health, chronic diseases, perception of symptoms, family history of chronic diseases, food and alcohol habits - and years of education were obtained from Questionnaire II presented at the examination and completed at home. No reminder was distributed to the non-responders.

Three weeks after the termination of the whole screening Questionnaire III was sent to all persons originally invited to the screening. It included questions on use and opinions of health care services, use of drugs, conditions of work, migrational prospects, well-being, social networks, household characteristics, health related behaviour and outdoor life. A reminder was distributed to the non-responders of the third questionnaire.

The total number of individuals attending the screening were 9043 men and 8823 women. Of the eligible population, when excluding a total of 1833 individuals reported being dead, moved or temporarily absent, the attendance rate was 81.0 in men and 88.2 per cent in women. The lowest attendance rate was found among the youngest (20-29 years) and the unmarried.

All attenders filled in Questionnaire I, and the response rate to Questionnaire II and III was 72.9 and 78.5 per cent respectively. Table 2 gives the eligible population, attendance rate and response rate to all questionnaires according to sex, age, marital status and geographical region. The analyses presented in this article are based on information from both the screening and all three questionnaires. Among those who attended the screening 61.3 and 62.3 per cent in men and women, respectively, filled in all the three questionnaires, with a higher response in the oldest age-group and among married. One geographical region contrasted the other regions with a 10 per cent lower response rate.

Comparative analyses on a wide range of characteristics of non-responders versus responders of the questionnaires were carried out in order to judge possible selection biases caused by non-response. These comparisons showed that non-responders differ from the responders in a number of respects. The differences, however, were minor in magnitude except for the higher proportion of smokers (57 % vs 50% in men and 50% vs 43 % in women), of high physical activity at work (67% vs 62 % in men only) and myocardial infarction risk score (60.6 vs 51.9 in men and 10.4 vs 9.0 in women) in non-responders versus responders. A crucial question related to the analyses in the this paper has to do with the possibility of distortion of associations. Comparing the results of multiple regression analyses by including and excluding the non-responders

respectively, these distortions were not of sufficient magnitude to substantially bias the estimates of parameters. Given the very high non-attendance in age-group 20-29 not attending the screening, however, the decision was made to exclude this age-group from the analyses. Thus, after excluding cases with missing data and age-group 20-29, a total of 4549 men and 4360 women represented the effective material.

STATISTICAL ANALYSES

When variables are all ordinal or of mixed scale types, the use of product moment correlations based on raw scores are not recommended. Instead, polychoric or polyserial correlation coefficients should be used (23, 26). Based on the polychoric and polyserial correlation matrix of the model variables, parameters were estimated by employing the Lisrel, submodel 2 (causal models for directly observed variables, Lisrel VI within SPSS-X). We assume the disturbance terms to be unrelated to each other and to the x-variables. The estimates appeared unaffected by the estimation method, i.e. unweighted least squares compared to maximum likelihood. Standardized values of parameters were estimated for men and women separately, i.e. we are not making estimates of the magnitude of the gender effects. Sex specific zero-order correlations and estimates of direct and total effects are given. Total effects are the sum of direct and indirect effects and reflect the amount of change in a variable that is induced by a given

unit (standard deviation) change in an antecedent variable under the given model, regardless of the particular intervening mechanisms through which these changes occur (27). Indirect effects are components of the total effect of a variable that are mediated by variables specified by the model as intervening between the causal variable and the dependent variable of interest.

Some stratified and supplementary analyses were performed. First, coefficients within 10-year age-groups were estimated in order to uncover possible age-specific patterns of the process under investigation. Second, replication of analyses were performed after having excluded individuals receiving disablement benefit. Finally, global life satisfaction (Do you in general like the way things are? Not at all, not so much, more or less, very much) was included as the ultimate dependent variable of the model.

RESULTS

Table 3 shows the distribution of self-rated health by age in men and women separately. Subjective health deteriorated markedly with increasing age in both sexes. The most marked deterioration appeared at age 50-54 in women and 5 years later in men. Between the sexes only moderate differences were revealed except for age-group 50-54, were women judged their general health to be markedly lower than men.

The zero-order correlations between variables entering the model, for men and women separately, are given in Table 4. Table 5 (men) and Table 6 (women) show the estimates of direct and total effects of the model. Most of the predictions, with some exceptions, of the direct effects were supported by the empirical findings in both men and women (significant at the .05 level). In addition, direct effects not reaching the level of significance in men appeared low in magnitude in women. Two exceptions were the effect of age on psychological distress and level of urbanization on disablement benefit.

The assessment of the extent to which the proposed model fitted the data the chi square distribution was used. With 2 degrees of freedom, the probability was greater than .05 in men, indicating an acceptable fit or that the restrictions of the model,ie. effects fixed at zero, are supported. In women,

however, an acceptable fit was reached after removing the restriction of an effect of myocardial infarction risk score on physical distress.

Considering the magnitude of the direct, indirect and total effects, two overall observations are apparent from the estimates in Table 5 and 6. First, among the independent variables both years of education and fear of loosing employment was found to have appreciable direct or indirect effects on self-rated health. Second, physical distress and disablement benefit appeared as the main mediating factors producing variation in self-rated health in both sexes.

As seen from the estimates, all dependent variables, except for psychological distress, are effected by educational achievement. With increasing years of schooling both chronic disease, myocardial infarction risk score and physical distress are reduced. Moreover, this variable appeared to have the largest direct effect on disablement benefit (except for fear of losing employment) and preoccupation with health, whereas the direct effect on self-rated health was found to be negative. The importance of considering both direct and indirect effects are clearly demonstrated when interpreting the effect of years of schooling on self-rated health. Although the estimated total effect on self-rated health was clearly positive, the direct effect appeared as negative. This is due to several positive indirect effects, in particular the effect mediated through disablement benefit.

Fear of unemployment was mainly found to increase psychological distress and to reduce self-rated health. The total effect on self-rated health, however, appeared small due to the fact that an important part of the effect of this variable operates indirectly via disablement benefit.

The hypothesized positive effect of leisure physical activity and social networks on self-rated health was supported by the empirical findings. The effect of level of urbanization appeared to be different in men and women. A predicted negative effect on disablement benefit was found in men only, while a positive effect on preoccupation with health appeared in both sexes. Most of the effects of age seem plausible: Increasing chronic disease, myocardial infarction risk and disablement benefit. Considering the effect of age on self-rated health, the estimated total effect was negative. The estimated direct effect, however, was positive due to the fact that most of the indirect effects are negative. Again we see that disablement benefit operates as the most important transmitter of effects.

Self-rated health was both directly as well as indirectly affected by all the introduced dependent variables, except for preoccupation with health in women. In both sexes disablement benefit had the largest total effect on self-rated health, whereas the total effect of chronic disease, psychological distress and physical distress were comparable in magnitude. The pattern of the intervening mechanisms of the various

health status measures was interesting. First, the direct effect of both chronic disease and psychological distress was found small in magnitude, and that the substantial part of the effects of these measures operate indirectly via physical distress and disablement benefit.

The predicted negative effect of preoccupation with health on self-rated health was supported by empirical findings in men. The magnitude of the effect, however, was relatively modest. Educational achievement and social network appeared to have the largest effect on preoccupation with health.

Stratified and supplementary analyses.

The same pattern of overall interrelationship among the variables appeared when the estimates of coefficients were made within 10-year age-groups (results not given). Comparisons based on the standardized values of estimates, however, indicated both disablement benefit, fear of losing employment and educational achievement to have a stronger negative direct effect on self-rated health in the two youngest age-groups compared to the oldest. In addition the effect of preoccupation with health on self-evaluated health appeared positive (.107) among women aged 30-39.

In order to have estimates restricted to individuals not being exposed to the work disablement role, all analyses were

repeated after excluding individuals receiving disablement benefit from the material. The interrelationship among the dependent variables appeared relatively the same, except for a stronger impact of psychological distress on self-evaluated health. In both men and women the hypothesized negative effect of preoccupation with health on self-rated health was supported by empirical findings (.064 and .032). The direct effect of educational achievement on self-rated health was estimated to be positive in both men and women. Finally, fear of unemployment appeared mainly to effect psychological distress and to have only a minor effect on self-rated health

A final supplementary analysis was to include global life satisfaction as the ultimate dependent variable of the model. Psychological distress was found to have the largest direct effect on life satisfaction (-.322 in men and -.327 in women), whereas the positive effect of self-rated health was estimated to be .190 and .149 in men and women respectively. The effects of other dependent variables were low. Among the independent variables fear of unemployment was found to have a direct negative effect on life satisfaction (-.218 in men and -.119 in women).

DISCUSSION

In the present study a structural equation model was proposed to explore mechanisms involved in global self-evaluation of health. The model integrates various dimensions of health status and assumes links between somatic, psychological and physiological measures, and social and behavioral characteristics. The findings suggest physical distress, measured as symptoms of pain from various parts of the body, and the work disablement role to play the key role in reducing self-evaluated health. Moreover, the impact of both these key factors is strongly socially patterned. Seen together with two other important determinants, fear of unemployment and physical activity, we may suggest that the important dimension reflected by global self-evaluated health is the overall interpretation of own suffice in general, of how people handle the various stressors and the 'pain in life'.

The empirical basis for a structural model of this kind might be shaky, suggesting that the question of plausibility represents a major challenge. Although complex, our model obviously represents an oversimplification. Still we judge the plausibility of most specifications to be fairly strong the theoretical argument underlying the specification of only recursive effects is weak. A more appropriate assumption might be to specify reciprocal effects among some of the measures of health status, in particular between psychological

and physical distress.

An important theoretical consideration is that the various dimensions of health status should be identified and treated as distinct entities (1,2). The introduced measures in the present analyses are judged to cover most of the dimensions postulated by other authors (1). Since errors of measurement might bias the estimates, however, the assumption that all variables are measured without measurement error is questionable. A better strategy might have been to employ a measurement model, where the various dimensions were considered as latent variables reflected by their specified indicators. Estimation of reliability components in cross-sectional research designs, however, are plagued with problems of interpretation (27).

It should be noted that the massive amount of information available concerning those defined as non-responders of this study, gives an excellent opportunity to address the problem of possible selection bias caused by non-response. Non-responders were found to differ from the responders in various respects in accordance with other studies (28-29). The magnitude of these differences, however, appeared surprisingly low. This, together with analyses on how the exclusion of non-responders influenced the relationships between selected variables, suggest the selection biases in our material to have no important impact on our estimates of the parameters.

The impact on self-rated health of most of the prior variables are low or modest. When considering the magnitude of direct and indirect effects, the role of physical distress and disablement benefit in the determination of self-rated health provides an important focal point in the interpretation of the process involved. Interesting is the role physical distress seems to play both independently, indicated by the direct effect, and as an important transmitter of effects. First, these findings support a previous suggestion that the level of physical symptom experience play a more crucial role in reducing self-rated health than the labelling associated with diagnoses of chronic disease (6). As stated by Mechanic (30), however, physical symptoms reflect both physical illness or diseases, psychological state, situational stressors and prior learning. A careful examination of the various indirect effects appearing in the present analyses, gives support to these suggestions. Further, the role of physical symptom experience might be that of a 'medium', i.e. being an important reflection of how people handle serious stressors and the "pain in life" .

It is noteworthy that the effect of labelling associated with chronic disease contrasted very strongly with that of permanent work disablement. Two interesting observations should be noted concerning the role played by disablement benefit in the determination of self-rated health. First, a substantial part of the effect of educational achievement

operates indirectly via disablement benefit. Second, disablement benefit, independent of prior variables, provides a very strong direct influence on self-rated health. These findings give support to the stated theoretical considerations of self-rated health being linked to life situations or stratificational processes (3, 18). Length of schooling is often seen as the most important factor producing differences in status attainment. The strong direct negative effect of educational achievement on disablement benefit appearing in present analyses support the previous finding that the chance of receiving disablement benefit in Norway strongly reflects variation in conditions of living (24). It should further be noted that a low level of education tends to associate both with higher exposition to physically demanding jobs and reduced possibilities at the labour market. These two forces working together seem obviously to have an important impact on the classification mechanisms involved in this kind of permanent work disability. The very strong direct negative effect on self-rated health might indicate that the work disablement role sets off a specific process of adaptation. Wadel (31) found that people being exposed to permanent unemployment will try to legitimate their situation by means of presenting or defending what is specific of their destiny. Stressing the sick role might act as an effective way to justify the work disablement role. This possible explanation should, however, not be isolated from the theory of the fundamental role work plays in the life of man.

Unemployment per se is found to represent a serious stressor

with negative health outcomes (19, 32-33). In a society with unemployment as a minor problem in an international perspective, but with a rising economic depression, fear of unemployment might represent a similar serious stressor. The assumed negative effect of fear of losing employment on self-rated health was supported by the empirical findings. An interesting finding was that disablement benefit played an important role as transmitter of effect on self-rated health, i.e. the negative direct effect increased most probably due to the fact that receiving disablement benefit per se gives full or partly economical security.

A phenomenon reported from highly industrialized societies in the last 10 years is the population's growing occupation and fascination with health (34-35). This kind of new "ism", "healthism", might reflect an ongoing change in the population's perception of illness and concepts of health. Besides having obvious health benefits, it has been suggested that it might result in substantial negative effects on health-illness evaluations (34). Our finding of a negative, although weak, direct effect of preoccupation with health on self-rated health, adds some credibility to this hypothesis. The validity questions involved in measuring the phenomenon of healthism, however, need to be more seriously addressed in future studies. Our assumption is that preoccupation or fascination with health will be positively related to health related behaviour. The best determinant of the employed measure of preoccupation with health appeared to be

educational achievement. The more educated, the more occupied with health. Together with positive effects of both physical activity and urbanization, this measure appears to tap positive health life-style dimensions. The mechanisms involved, however, are complex. Future investigations should therefore in particular consider the suggested phenomenon together with introspectiveness as personal inclination found to affect the perception of threat, coping and the illness experience (36).

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Table 1. Independent and dependent variables in the model.

Variables	Descriptions
x1	**Age**: In years (30-62).
x2	**Urban**: Population of the municipality (1-3): less then 2000, 2000-, 4000-14000.
x3	**Years of schooling.**
x4	**Fear of losing employment**: Risk the coming years due to closing down, reductions or other reasons, No,yes(0,1): Yes stated by 16.8 % (men) and 10.1 % (women).
x5	**Leisure physical activities**: Sedentary, moderate, keep fit exercise, athletes (1-4).
x6	**Social networks**: Exchange services with neighbours, index(0-8)
y1	**Chronic disease**: Myocardial infarction, Angina pectoris, Diabetes, Psoriasis, Asthma, Bronchitis, Ulcus of stomach or duodenum, Rheumatoid arthritis, Cancer and Migraine, Epilepsy: all coded (0,1) and added to an index (0-5).
y2	**Psychological distress**: Index (0-2) based on depression (0,1) and sleeplessness(0,1).
y3	**Myocardial Infarction Risk Score**: Based on serum cholesterol, systolic blood pressure and cigarettes currently smoked per day.
y4	**Physical distress**(pain): Low back pain, Chest pain when walking steps, Pain from upper part of stomach, Heartburn, Pain from joints: all coded (0,1) and added to an index (0-5).
y5	**Disablement benefit** (DB, 0-2): 1=receive DB and had a part-time job last year, 2=receive DB and no paid employment last year (full or partial permanent work disability reported by a total of 13.2 % and 19.4 % in men and women respectively).
y6	**Preoccupation with health**: Talked to family members(0,1) or friends(0,1) about health matters the last two weeks (0-2).
y7	**Self-rated health**: In general, how would you say your health is? Poor, fair, good, very good (1-4).

Table 2. Response rate (%) to questionnaire (Q) 3 and to all questionnaires (those who filled in all three questionnaires) among attenders of the screening. Rates are given according to sex, age-group, marital state and geographical region. The Finnmark Study 1987-88.

RATE	ELIGIBLE POPULATION*		ATTENDANCE RATE		RESPONSE TO ALL Q's	
	Men	Women	Men	Women	Men	Women
All	11132	9977	81.0	88.2	61.3	62.3
AGE						
20-29	508	496	54.7	70.2	57.6	59.2
30-39	1688	1540	74.3	86.2	60.7	61.1
40-49	4469	3845	82.4	89.1	59.9	59.7
50-62	4467	4096	85.2	90.4	63.1	65.4
MARITAL STATE						
Married	6976	7052	88.1	91.5	62.4	63.2
Un-married	4156	2925	69.2	80.3	58.9	59.8
REGION						
Fishery	2675	2338	81.3	88.7	60.1	62.4
Fjord	1265	1041	81.9	89.7	50.7	50.6
Inland	1565	1293	80.3	89.0	60.1	62.0
Town	5627	5305	80.9	87.6	64.6	64.7

* After excluding 1833 individuals reported being dead, moved or temporarily absent.

TABLE 3. Distribution (%) of subjects according to self-rated health status and age in 6291 men and 6096 women aged 20-62. Finnmark 1987-88.

	MEN				WOMEN			
AGE	Poor	Fair	Good	Excel-lent	Poor	Fair	Good	Excel-lent
30-34	1.0	11.6	57.4	30.0	1.5	9.1	58.6	30.8
35-39	2.1	14.5	56.6	26.9	2.2	14.2	58.8	24.9
40-44	2.0	15.3	61.7	21.1	1.9	18.3	62.0	17.8
45-49	3.2	17.1	59.1	20.6	3.6	20.6	59.8	16.0
50-54	3.4	24.1	57.4	15.1	4.9	29.4	51.6	14.0
55-59	6.7	31.2	51.3	10.8	5.7	34.0	51.0	9.4
60-62	7.0	31.8	51.8	9.3	6.6	35.3	49.8	8.3
Total	3.8	21.4	56.9	17.9	3.9	24.3	56.1	15.7

Table 4. Zero-order correlations [1] between variables entering the model for 4658 men (below the diagonal) and 4308 women (above the diagonal).

Variable	Correlation with (x1)	(x2)	(x3)	(x4)	(x5)	(x6)	(y1)	(y2)	(y3)	(y4)	(y5)	(y6)	(y7)
Age (x1)	-	-.011	-.437	-.116	.014	-.238	.125	.135	.434	.156	.519	-.038	-.259
Urban (x2)	-.043	-	.163	-.198	-.013	-.042	-.036	-.026	-.059	-.029	-.002	.067	.035
Years of schooling (x3)	-.397	.193	-	-.107	.043	.194	-.126	-.123	-.311	-.179	-.519	.180	.301
Fear of losing employment (x4)	-.073	-.188	-.198	-	.007	.077	.031	.097	.005	.002	-.341	.055	-.004
Leisure physical activity (x5)	-.066	.039	.104	-.081	-	.098	-.058	-.081	-.050	-.080	-.119	.049	.202
Social networks (x6)	-.196	-.000	.156	.062	.118	-	-.017	-.091	-.093	-.051	-.254	.245	.155
Chronic disease (y1)	.210	-.043	-.158	.037	-.096	-.056	-	.259	.051	.412	.372	.047	-.374
Psychological distress (y2)	.026	-.007	-.060	.151	-.092	-.066	.271	-	.092	.416	.369	.051	-.447
MI Risk Score (y3)	.232	-.078	-.197	.034	-.141	-.056	.055	.064	-	.114	.249	-.065	-.186
Physical distress(pain) (y4)	.117	-.048	-.210	.152	-.081	-.007	.423	.394	.059	-	.424	.121	-.569
Disablement benefit (y5)	.521	-.124	-.485	-.321	-.084	-.196	.454	.335	.151	.408	-	-.033	-.608
Preoccupation with health (y6)	.023	.105	.158	.011	.073	.189	.079	.046	-.044	.113	.001	-	-.051
Self-rated health (y7)	-.248	.078	.277	-.116	.237	.117	-.405	-.403	-.177	-.537	-.570	-.082	-

[1] Polychoric (when a pair of variables are ordinal) and polyserial (one ordinal and the other continuous) correlation coefficients are estimated when the ordinal variable in a pair of variables have number of values less or equal to 8.

Table 5. Estimates of direct effects and total effects (in italics) of the model in 4549 men. Standardized solution.

Var.	Variables x1	x2	x3	x4	x5	x6	y1	y2	y3	y4	y5	y6	R^2
y1	.178	-.013*	-.071	.028*	-.074	-.003*							.058
	-	-	-	-	-	-							
y2	-.030*	.046	.006*	.148	-.051	-.061	.266						.102
	.017	.042	-.013	.156	-.071	-.062	.266						
y3	.183	-.046	-.103	.001*	-.113	.012*	-	.043					.084
	.183	-.044	-.104	.008	-.116	.009	.012	.043					
y4	.002*	-.003*	-.135	.066	-.010*	.048	.322	.291	-				.290
	.064	-.011	-.162	.121	-.054	.029	.399	.291					
y5	.264	-.116	-.362	-.465	.004*	-.030	.208	.248	-.015*	.181			.732
	.315	-.106	-.408	-.399	-.045	-.041	.346	.300	-.015	.181			
y6	.103	.097	.230	.091	.053	.179	.031*	-.019*	-.021*	.105	.090		.102
	.139	.088	.177	.065	.045	.179	.099	.038	-.022	.121	.090		
y7	.067	-.045	-.126	-.287	.146	.028	-.017*	-.044	-.081	-.231	-.617	-.047	.535
	-.167	.016	.165	-.079	.197	.040	-.340	-.302	-.070	-.348	-.621	-.047	

- Total coefficient of determination for structural equations= .752
- Chi-square with 2 degrees of freedom=3.36, probability=0.186
- Direct effects: All estimates are standardized and are significant at the .05 level except those marked by *

x1: Age
x2: Urban
x3: Years of schooling
x4: Fear of loosing employment
x5: Leisure physical activity
x6: Social networks

y1: Chronic disease
y2: Psychological distress
y3: MI Risk Score
y4: Physical distress (pain)
y5: Disablement benefit
y6: Preoccupation with health
y7: Self-rated health

Table 6. Estimates of direct effects and total effects (in italics) of the model in 4360 women. Standardized solution.

Var.	Variables x1	x2	x3	x4	x5	x6	y1	y2	y3	y4	y5	y6	R^2
y1	.101	-.016*	-.078	.029*	-.059	.025*							.027
	-	-	-	-	-	-							
y2	-.091	.006*	-.028*	.104	-.062	-.062	.236						.098
	.115	*.002*	*-.047*	*.111*	*-.076*	*-.056*	*.236*						
y3	.381	.026*	-.139	.026*	-.051	.029	-	.019*					.211
	.383	*-.025*	*-.139*	*.028*	*-.053*	*.027*	*.005*	*.019*					
y4	.020*	-.003*	-.088	-.048	-.032	.015*	.313	.322	.032				.287
	.100	*-.008*	*-.132*	*-.002*	*-.077*	*.005*	*.390*	*.322*	*.032*				
y5	.232	-.001*	-.373	-.375	-.059	-.064	.188	.209	-.024	.152			.671
	.282	*-.004*	*-.414*	*-.348*	*-.096*	*-.070*	*.296*	*.257*	*-.016*	*.152*			
y6	.070	.066	.241	.139	.036	.239	-.025*	-.009*	-.034	.133	.129		.125
	.104	*.065*	*.177*	*.081*	*.017*	*.230*	*.062*	*.067*	*-.031*	*.153*	*.129*		
y7	.054	-.002*	-.049	-.168	.105	.025	-.032	-.108	-.045	-.294	-.513	-.019*	.546
	-.155	*.003*	*.212*	*-.005*	*.189*	*.059*	*-.325*	*-.337*	*-.046*	*-.374*	*-.515*	*-.019*	

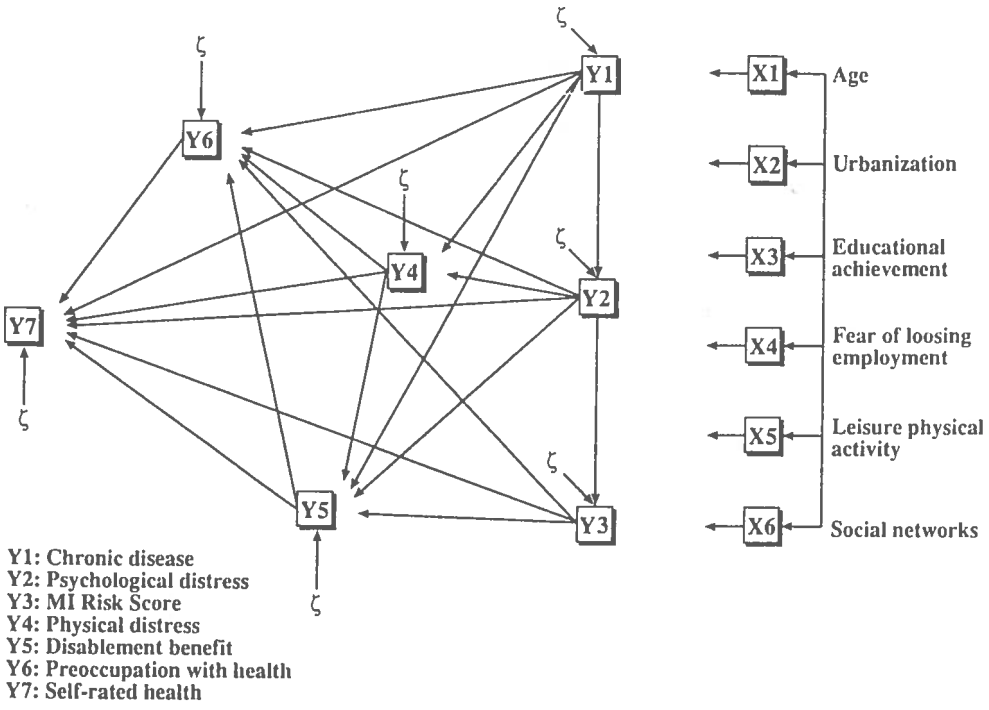
- Total coefficient of determination for structural equations= .709
- Chi-square with 1 degree of freedom=3.10, probability=0.08
- Direct effects: All estimates are standardized and are significant at the .05 level except those marked by *

x1: Age
x2: Urban
x3: Years of schooling
x4: Fear of loosing employment
x5: Leisure physical activity
x6: Social networks

y1: Chronic disease
y2: Psychological distress
y3: MI Risk Score
y4: Physical distress (pain)
y5: Disablement benefit
y6: Preoccupation with health
y7: Self-rated health

Legend to the figure:

Figure 1. The proposed model.



PAPER III

THE TROMSØ STUDY: FACTORS AFFECTING PATIENT-INITIATED AND PROVIDER-INITIATED USE OF HEALTH CARE SERVICES

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ABSTRACT

The aim of this study was to examine factors influencing decisions involved in I)patient-initiated visits to general practitioners and II)provider-initiated referral services use. The analyses were performed with regression models on a set of data from a comprehensive population study of 7369 men aged 20-61 and 6832 women aged 20-56. Marked sex differences appeared both on patient-initiated and physician-initiated health care use. The various health status dimensions were found to be important determinants of patient-initiated use, in particular self-rated health, physical distress and transitory morbidities. Further, having a primary provider was found to strongly increase patient-initiated use. Among the health status measures only self-rated health and chronic disease appeared as important determinants of provider-initiated use. Age and years of education were negatively associated with GP visit and positively associated with use of referral services. The increased referral of patients with higher educational achievement indicates a social status bias among general practitioners creating a substantial inequitable access to referral services. Further, the analyses indicate positive lifestyle to be associated with an increased health care consumption among men.

Key words: Illness behaviour, self-rated health, help seeking, barriers to care.

INTRODUCTION

Professional help seeking is a part of a process of illness behaviour that involves the manner in which individuals monitor their bodies, define and interpret their symptoms, take remedial action, and utilize various sources of help (Mechanic 1986). The illness behaviour patterns of the population is expected to be in a continuous process of change. Judged from numerous reports on a definite upward trend in the focus on health issues and the use of health care services, medical care seems to play a more and more important role in daily life.

The complex sorting process involved in help seeking is dependent on a variety of factors other than the amount and severity of illness, and the lay referral system is assumed to play a crucial role in the handling of illness (Mechanic 1978, Freidson 1960). The idea of a continuum of care, from pure self-care to pure professional care, recognizes in particular the central role individuals play in their own care (Dean 1989, Bentzen et al. 1989). A large proportion of what is viewed as illness is found to be handled solely by the individual alone or in assistance of other laymen (White 1961, Kleinman 1980, Grimsmo 1984)

The goal of equity in access to professional health care represents one of the cornerstones of the global strategy of

Primary Health Care Approach. In general, equity has to do with equal access for equal need, implying that equity is most appropriately judged by examining people's use relative to their illness experience. There is, however, no consensus as to how to measure the attainment of the goal. Although various models of health care utilization have been developed, considerable confusion exists concerning the concept of barrier to care (Mechanic 1979, Melnyk 1988). The theoretical framework developed by Andersen and co-workers seems to represent the guide most frequently used by researchers for this type of analysis (Andersen and Newman 1973). Results from most large-scale multivariate studies are consistent with the hypothesis that only minor inequalities exist in the use of health care services, findings that contradict with qualitative literature on use of health care services (Mechanic 1979).

The aim of the Norwegian health care delivery system has for long been to establish equality in access of health care (Sosialdepartementet 1988). The system is relatively uniform, and the influence of financial barriers on the use of services is not expected to exist. A multivariate analyses performed on a set of national data collected in 1973-74 showed that factors other than those introduced as need indicators were of minor importance in explaining variation in the use of general practitioners during one year (Andersen and Laake 1983). This finding has been supported by local studies (Grimsmo 1984, Elstad 1987). A study from 1975, considering different

types of physician services utilization registered in a 2-week period, revealed some variation by social status and geographical distribution of services (Andersen and Laake 1985).

The Norwegian Health Survey 1985 revealed an increase in the total number of GP consultations during the last 10 years of about 50 per cent (Elstad 1991). This striking increase may partly be explained by the strong increase in the number of GPs during the same period. Moreover, in particular when seen in a more long-term perspective, it may as well either be a reflection of, or may have led to, a change in the population's concepts of health, tolerance thresholds for pain and discomfort. To the professional health care delivery system the increasing use represents important challenges in terms of priority questions and cost containment, and contributions trying to penetrate the pattern of health care utilization are badly needed.

The aim of this study is to explore the determinants of I) patient-initiated and II)provider-initiated use of health care services. Health is multidimensional. Therefore, an important theoretical consideration has been to make distinctions between the various dimensions of health status rather than to handle them together just as an indicator of need. The assumption is that the majority of the included health status dimensions are shaped by social and psychosocial factors. We assume both health status, sociodemographic

factors and presence of a primary source of care to influence provider-initiated use. The model used to study patient-initiated help seeking also includes family characteristics and health promoting lifestyle indicators.

MATERIALS

All men aged 20-61, women aged 20-56 and a sample of the population aged 12-19 in the municipality of Tromsø were invited to the third Tromsø study. A total number of 21826 individuals were examined i.e. 81.3 per cent of the eligible population. The screening by the National Health Screening Service started in September 1986 and was finished in April 1987. The present study is restricted to men aged 20-61 and women aged 20-56.

The main components of the survey were two self-administered questionnaires and measurements of weight, height, blood pressure and serum lipids. Questionnaire I, accompanying the letter of invitation, comprised questions on previous cardiovascular disease, diabetes, symptoms possibly caused by atherosclerotic diseases, leisure time activity, type of work, smoking habits and consumption of salt, fat and coffee. This questionnaire was almost identical to that used in former studies in Tromsø and Norwegian counties (Thelle et al. 1976, Bjartveit et al. 1979). The second questionnaire, which was

presented at the examination, asked for more details on topics like self-evaluation of health status, diseases and symptoms, medications, use of different kinds of health care services, dietary habits, alcohol consumption, physical activity, psycho-social aspects and several demographic characteristics. It was completed at home and returned by mail by 91.8 per cent of the examined.

THE VARIABLES AND THEORETICAL ASSUMPTIONS

Health care use

Figure 1 illustrates the probabilities of utilization the year preceding the interview according to type of services in men and women, separately. According to established referral procedures in the community studied, it is assumed that individuals who are users of referral level care (specialist services, hospitalization) are restricted to those consulting a GP. The decision to seek a GP is primarily made by the individual, level A in Figure 1. The second decision level, B in the same figure, is principally provider influenced. In order to make distinctions between patient-initiated and provider-initiated consumption, the following dependent variables were used:

1. Number of GP visits (not including contacts with industrial physicians) in the total database.
2. Number of GP visits after having excluded individuals with referral services use.

3. Non-consumers vs. consumers after having excluded individuals with referral services use.
4. Consumers with GP visits only vs. referral level consumers.

The rationale behind the inclusion of variable 2 is the assumption that the use of GP's among the consumers of referral services might be influenced by the provider (follow-up visits etc.). Thus variable 2 (volume) and 3 (nil visits vs. one ore more visits) represent the best possible measure of patient-initiated use.

We expect the model to explain GP visit to be different from the model of provider-initiated referral services use. The latter includes the various dimensions of health status, sociodemographic characteristics and having a primary professional source of care. The "ideal" referral system should reveal health status measures as the main effect variables. Our model to explain professional help seeking includes in addition family characteristics and indicators of health promoting lifestyle, the latter assumed to tap a dimension of self-care.

Table 1 contains the definitions of the independent variables.

Sociodemographic characteristics

Tromsø is the regional service centre of Northern Norway with a total population of 50,000. Most people live near the town centre, and 84 % of the individuals in our study live in an urban area. The referral health care services are located in the town centre. In order to secure equal availability of GP services, however, provision of these services is geographically well distributed, and in the rural areas ambulatory services are provided on a regular basis. Besides being an indicator of sociocultural variation, the included geographical variable thus is assumed to represent a possible barrier in terms of travelling time to referral services only. In Norway the employment status per se is assumed to influence the use of GP services. If an employee is absent due to illness for more than 3 days, a physician's report must be submitted to the employer. Most researchers assume educational achievement to basically measure variation in attitude or inclination to seek help. In a system with no financial access barriers, but with queues as an important regulating mechanism, low educational achievement might well act as an important access barrier.

Primary provider

Having a primary provider has been found to be an important determinant of utilization behaviour (Melnyk 1988, Andersen 1981). The bulk of the GP services provided in Tromsø are organized by the Public Primary Health Services, and a reported high rate of turn-over among GPs clearly reduces the

possibility to achieve a particular doctor as a regular source of care. In our material 28 % of the men and 47 % of the women reported having a primary provider.

Family characteristics

Family characteristics are included both as an indicator of family network (cohabitation and number in the household) and as an access barrier assumed to be measured by the two measures of family obligations (small children and other nursing needs). The family history of chronic disease measure the experience of some of the major chronic diseases within the family. The assumption is that a high burden of disease experience within the family affects attitudes toward illness and illness behaviour, a learned inclination.

Health promoting lifestyle

Self-care, defined as a range of behaviour undertaken by individuals to promote or restore their health (Dean 1989), includes both lay responses to illness, in contrast to professional care, and health promoting behaviour. The rationale behind including health promoting lifestyle is the assumption of a positive link between the two dimensions of self-care, and thus we postulate positive lifestyle to reduce professional help seeking.

Dimensions of health status

An important theoretical consideration has been to include the various dimensions of health status as distinct dimensions

(Ware 1986, Liang 1986). It is assumed that some of our measures of health status, in particular self-rated health in general, physical and psychological distress, are not simply indicators of illness, but shaped by multiple psychosocial, situational and attitudinal factors (Dean 1989, Mechanic 1979). Moreover, the various chronic diseases included are seen as reports on given medical diagnoses.

Our questionnaires did not allow the inclusion of lengthy self-report instruments on psychological and physical distress. The three questions on physical distress (neck/shoulder pain, low back pain, and headache, see Table 2), and the three questions on psychological/emotional distress (depression, sleeplessness, and coping problems, see Table 2) are assumed to cover important illness problems in terms of health care utilization. Moreover, a reasonable assumption is that the three items measure underlying variables (factors) or a common factor. Accordingly, a principal components analysis was performed on the three items assumed to tap physical distress, and a second analysis on three items assumed to tap psychological distress. Table 2 reveals that in both analyses the first component ('Factor') extracts about 50 % of the common variance in the set of items. Factor scores computed on the basis of the one-dimensional principal components analyses will be used in the statistical analyses. Importantly, this method reduces the number of highly correlated measures to be included in our explanatory models.

The measure of transitory morbidities, 'infections', represent an important supplement to the other standard health status variables (Pope 1988).

STATISTICAL ANALYSES

Multiple regression analyses of 1) number of GP visits in the total database and 2) number of GP visits after having excluded individuals with referral services use, were performed separately for each sex. The distribution of number of visits is made less skewed by means of a logarithmic transformation and the log-distribution better conforms with the assumption necessary for multiple regression analysis.

The likelihood of GP visits only versus non-consumers, and the likelihood of referral services use versus GP consultations only were estimated by using a logistic regression model. A total number of 504 men and 734 women reported referral services use and nil GP visits. This might either be due to a time-lag of more than one year since actual referral or that direct contacts actually happened. The group of "direct" referral care users, however, were not found to differ significantly from the other users of secondary level services, a finding that was confirmed by our separate analyses performed with exclusion of the "direct" users of secondary services. Consequently, all individuals reporting use of referral services were handled together in the analyses.

Supplementary analyses were performed in order to estimate the independent gender effect on GP visits (equation 2) and referral services use (equation 4), respectively. In these analyses all men and women aged 20-56 were included. An assumed interaction effect between gender and household members was found statistically significant and thus included in the analysis.

Other assumed interaction effects tested were: 1)gender and children, 2)psychological distress and chronic disease, 3)psychological distress and educational achievement, 4)self-rated health and chronic disease. When including these two-way multiplicative terms in the equations, term 2 and term 4 were found to be statistically significant in men. The inclusion, however, did not increase the explained variance, and the only substantial change in the various estimates was an increase in the estimated effect of chronic disease. The final sex specific analyses were therefore performed without the inclusion of any multiplicative term.

RESULTS

Figure 1 reveals a considerably higher use of professional health care among women compared to men. Considering the consumers of health care only, 41 per cent of the women had experienced referral services compared to 33 per cent in men. The average number of GP visits was found to be 1.22 (sd=1.92) in men and 2.00 (sd=2.39) in women (aged 20-56 in both groups). The corresponding figures among non-consumers of referral services were .98 (sd=1.60) and 1.66 (sd=2.22). The variation in mean number of GP visits by age appeared rather small, except for a somewhat higher use among the youngest age-groups in both men and women. Considering the use of referral services, however, this was found to increase with increasing age. The variation in use of services by educational attainment appeared rather strong and to vary inversely according to type of services: less GP visits and more referral use with increasing educational attainment. These findings together with the somewhat higher GP visits among the youngest age-groups contrasted the variation in disease and health status by educational attainment and age: reduced self-rated health, more distress and disease with increasing age and decreasing educational attainment. Interestingly, only depression and transitory infections showed an increasing trend by educational attainment and age.

Lack of primary provider was in both sexes found to be decreasing with age but not to be associated with educational

attainment.

Determinants of GP visits

Table 3 (men) and 4 (women) shows the results of the regression analyses. When comparing the estimates of each of the three dependent variables of GP visits, they are remarkably stable in terms of overall judgements of effects. The hypothesized effect of all the health status measures on GP visits was supported by the empirical findings. Self-rated health, physical distress and transitory infections, however, appeared as the strongest explanatory variables in either analysis and sex.

Having a primary provider was the single variable having the strongest effect on GP visits. The estimated odds in favour of GP use (versus no use) for those having a primary provider was 2 times as large as that for those with no primary provider. The use of general practitioners decreased significantly with both increasing age and educational attainment, the latter association being somewhat stronger in men compared to women. A significant effect of rural living area and employment status appeared in men only. None of the included family characteristics were found to effect help seeking in men. In women, however, both family history of chronic disease, small children in the household and the number of family members were found to have a significant influence.

The hypothesized reducing effect of health promoting lifestyle indicators was not supported by the empirical findings. In men, however, the findings indicate an opposite effect, a positive association between health promoting lifestyle and help seeking, in particular the significant influence of leisure physical activity.

Determinants of provider-initiated use

Among the health status measures only self-rated health and chronic disease were found to have a significant effect on provider-initiated use (Table 3 and 4). The probability of being referred was found to strongly increase with educational attainment. The estimated odds ratio between the two most extreme levels of education was 1.83 and 2.34 in men and women respectively. This finding should be considered together with the finding of an opposite effect of educational attainment on patient-initiated use. Further, the probability of provider-initiated use increased significantly with age and urban living area. Having a primary source of care, however, did not appear to have any independent effect on the chance of referral.

Supplementary analyses

The supplementary logistic regression analysis, performed to explore the gender effect on referral services use, estimated the odds in favour of being referred for women to be 1.59 times as large as that for men. The same analysis performed after having excluded individuals admitted to the hospital

gave a corresponding odds ratio of 1.46.

The analysis performed to test the gender effect on GP visits, revealed a beta coefficient of .181 (t=10.2).

DISCUSSION

Determinants of professional health care services use have been studied in a population served by a uniform health care system without financial access barriers and with strict rules of referral. We assumed the model explaining GP visits to be different from the one of provider-initiated referral services use. The results indicate some important access barriers to health care. First, lack of a primary source of care was found to represent a substantial barrier. Second, providers seems to be biased in favour of the higher social status groups. The estimated odds in favour of referral, given one or more GP visits, was for those with the highest level of education about 2 times as large as that of the group with low educational achievement. While all the included dimensions of health status was found to be significant determinants of GP visits, only self-rated health and chronic disease appeared as significant determinants of provider-initiated use.

In the matter of our method the assumption that decisions to seek primary care are primarily made by individuals alone or with lay referral assistance might seem somewhat questionable. The individuals were asked to recall the number of GP visits due to own health or illness in a 12-month period, and our data do not contain information on the reason for encounter. We are therefore not in the position of making distinctions between GP consultations initiated by the providers of care, like health checks and screening, and those strictly related

to illness. A health care system involved with health education aiming at regular preventative health care seeking of the population, is obviously paving the way for an increasing number of provider initiated GP consultations. The idea of regular check-ups, however, seems not yet to have significant support either by the Norwegian general practitioners or the public. Findings from a recent Norwegian study indicate that about 20 per cent of all GP visits are routine health controls or strictly preventative health care seeking (Central Bureau of Statistics 1987). Although our assumption thus seems fairly reasonable, the data constrains us to fully compare how individual characteristics predict patient-initiated health care use on the one hand and consultations initiated by the providers of care on the other. By implication, our model is expected to some degree overestimate the influence of patients on the help seeking, leading to an underestimation of differences between the two levels of health care.

Another data limitation involved is related to the "recall problem". When people are asked to recall their contacts with the health care services during the year preceding the interview, the obtained information is affected by memory bias. In a previous Norwegian study it was found that the reported number of GP visits during a recall period of one year was about two thirds of the estimated number when the period was two weeks (Andersen and Laake 1987). This bias might be reduced by just distinguishing between those

reporting nil versus one or more contacts. Interestingly, our conclusions would have been substantially the same if our analyses of GP visits were restricted to the dichotomous distinction.

One of the central question in health services research is whether the services are used according to need or not. This makes great demands on which health status measures to include in the model. The complete and complex pattern of illness and disease, however, can never be fully captured. Consequently, the illness and disease variables in the equation will have to be proxy variables of the same. Moreover, the ideal situation would have been to measure health status before treatment (Pope 1988). It is, however, not practically feasible to measure health status independently of medical treatment. In our model some of the most widely used health status measures are not included, like role limitations and restricted activity days. The inclusion of both chronic disease, physical distress and infections, however, are assumed to fairly well tap the same dimensions (Pope 1988). Moreover, results from various Norwegian studies suggest that our selected health status measures cover the bulk of the most frequent disease and illness problems presented at the office of general practitioners (Grimsmo 1984, Rutle 1983). From this it seems reasonable to assume that our health status measures, at least in the traditional somatic model, to a reasonable degree reflect the individual need.

Association with a particular doctor appeared in this study to be an important determinant of GP visits only. The magnitude of the impact appeared about the same as self-rated health and physical distress. An important problem related to this variable is, however, that people who get sick might seek help and subsequently identify that particular provider as their primary source of care (Andersen and Aday 1978). We judge this problem to represent substantial bias, and consequently the results in terms of policy implementation should be considered with care. Analyses performed after having excluded this variable did not reveal any substantial change in the estimates.

Self-rated health is assumed to represent summary statement of how various health threats or stressors are perceived by the individual. Together with the finding of self-rated health being an independent predictor of survival (Kaplan and Camacho 1983, Idler and Angel 1990, Kaplan et al. 1988, Mossey and Shapiro 1982), makes this single item variable of particular interest. In an other analysis, from the same study, we found this measure closely related to symptoms and diseases connected to the musculo-skeletal system and psycho-social problems, and less to age and some of the major chronic diseases (Fylkesnes and Førde 1991). In the present study it appeared as one of the most important determinants of both patient-initiated and provider-initiated health care use. This supports previous findings of self-rated health as an important predictor of use (Andersen and Aday 1978, Ware 1986,

Pilpel 1987, Weinberger et al. 1986). The strong independent influence on the chance of referral is noteworthy. All in all this may indicate that our single item measure reflects important dimensions not captured by other measures. Another explanation, as suggested by Kaplan (Kaplan et al. 1988), may be that contacts with the medical care system as such negatively influence the subjective health of individuals. In particular, when considering the increasing consumption, complexity and availability of health care services, this seems increasingly likely.

It is assumed that women have a greater readiness to professional help seeking than men (Mechanic 1978, Rutle 1983, Clearly and Mechanic 1982). The present study confirms the consistent finding of large sex differences in rates of utilization. As previously reported (Fylkesnes and Førde 1991), between the sexes only minor differences appeared on self-rated health in present study. In most other health status measures, however, women appeared with significantly higher scores. This might reflect both perceptional and attitudinal differences difficult to capture by the variables included in present study. Our main strategy has therefore been to do separate analyses for men and women. Thus the emphasis is on gender specific explanatory patterns more than the gender effect per se. Moreover, the stratified analyses are assumed to reveal important interaction effects related to sex.

The revealed effect of age was negative for patient-initiated use and positive for provider-initiated referral services use. Previous Norwegian analyses, based on national data collected in 1973-75 and taking differential morbidity into account, did not reveal any significant direct effect of age on either GP visit or referral care services among individuals aged 16-75 (Andersen and Laake 1983, and 1985). The greater use of general practitioners among younger than older women might be due to "needs" related to their reproductive role. The even stronger effect of age found in men, however, might indicate differences in propensity to use services. Age as an important factor producing differences in disease and health status was also found in present study, and a possible interpretation of the higher GP visits among younger than older men, although speculative, might be a changing trend in help seeking behaviour between generations, i.e. that new generations are more likely to seek health care compared to the older ones, given the same level of "need".

A number of studies from UK, with a very similar health care system to Norway, have revealed social inequalities in the availability and use of services (Townsend and Davidson 1982). Although the evidence seems to support the Titmuss's argument that "higher income groups know how to make better use of Service; they tend to receive more specialist attention;...", The Black Working Group found it difficult to interpret the existing data on GP visits and hospital in-patient and out-patient attendance, notably due to the problem of relating

utilization to need (Townsend and Davidson 1982, 206). Norwegian studies trying to take differential needs into account have not revealed any social inequalities in GP visits (Andersen and Laake 1983, Grimsmo 1984, Elstad 1987). Andersen and Laake (1985), however, reported a positive effect of social status both on GP visits and use of specialist services, ie. higher probability of contact with an increase in the value of social status. Although their model specification made the interpretation of the effect difficult, the authors found support from other results that the social status effect was "due to lower contact probability among those not economically active than among those who are economically active" (Andersen and Laake 1985, 80). Educational attainment in the present study can be interpreted as a proxy variable for social status. The findings revealed a positive effect of social status on referral, that people with higher education are more likely to be referred compared to those with low educational background. On all included health status/disease measures, except for our single item on depression and transitory infections, the less educated who were referred appeared "sicker" than the better educated who were referred. Based on our assumption that decisions involved at this level are principally provider influenced, this may indicate an existing social status bias among general practitioners. A possible explanation is that higher educational groups present illness problems in a way that more often match professionals conceptions of the objectives of the referral services. Several studies from UK seem to supported

this explanation (Townsend and Davidson 1982, 79). In a study of the nature of GP consultations Cartwright and O'Brien (1976) found that some aspects of the doctor-patient relationship differed between working-class and middle-class patients. Altogether their data suggested doctors to have a less sympathetic and understanding relationship with their working-class patients, and the middle-class to have a greater ability to communicate with doctors effectively and to be more confident of own opinions.

Barsky (1988) reports that increased attention to one's body and one's health is associated with a tendency to enlarge somatic symptoms and generally with greater feelings of ill health. These are possible mechanisms involved in explaining present finding of a positive association between health promoting lifestyle and help seeking. If so, this may reveal side-effects of the "propaganda" for a healthy life-style very disappointing considering the expected great potential benefit in reducing use of curative services. The finding seems to challenge our methods in health education.

In summary, which are the threats against equity in access in the uniform and egalitarian Norwegian health care system which uses queues and administrative barriers as main controlling mechanisms? In an ideal model one would expect that the higher morbidity in the lowest social groups would result in higher consumption of health care. This seems fairly well to be the case related to GP visits. Our opposite finding on the

provider-initiated use, however, indicates an existing bias towards the higher social status groups on the use of referral level services, creating a substantial inequitable effect. The same considerations can be made on the surprisingly weak effect of age, which was far weaker than the corresponding increase in morbidity. These considerations, all together, indicate access barriers to exist primarily related to social status and individual resources like communicative skills at consultations.

The present study is restricted to solely quantitative aspects of health care use, and thus excludes important qualitative aspects related to the adequacy and quality of consultations. Present finding of access barriers strongly indicate that supplementary qualitative studies are needed in order to fully capture the processes involved.

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Table 1. The independent variables.

Descriptions
Sociodemograpic characteristics:
- Age (years)
- Level of education: Number of years of education, grouped in <8, 8-10, 11-12, 13-16, and >16 years (1-5)
- Rural living area (0,1)
- Employment status: Graded 1-3: no paid employment, part time, full time)
Primary provider (GP): Those who could state the name of their primary provider=1 (0,1)
Family characteristics:
- Cohabitation/marriage(0,1)
- Number in the household (1-8)
- Children 10 years of age or younger (0,1)
- Nursing needs in the household, apart from children (0,1)
- Family history of chronic disease: In the nearest family related to myocardial infarction or angina pectoris, diabetes, asthma, rheumatoid arthritis and cancer (0-2)
Health promoting lifestyle indicators:
- Leisure time activities (graded 1-4:sedentary, moderate, keep-fit exercise, athletes)
- Consumption of alcohol (graded 1-4:number of times at one occasion last year consumed at least one bottle of vine or the equivalent)
- Cups of coffee a day (1-5)
- Daily smoking (0,1),
- Relative Body Mass Index
- Myocardial Infarction Risk Score (based on serum cholesterol, systolic blood pressure and cigarettes currently smoked per day), log-transformed.
Dimensions of health status:
- Self-rated health: Based on the question "How would you rate your health overall?" and the respondent given 5 alternatives: 1)Excellent 2)Good 3)Fair) 4)Poor 5)Very poor. In the analyses alternative 4 and 5 were pooled.
- Chronic disease: Myocardial infarction, angina pectoris, diabetes, psoriasis, asthma, bronchitis, peptic ulcer, gastric ulcer, duodenal ulcer, rheumatoid arthritis, cancer and migraine: all coded (0,1) and added to a "disease index" (0,2).
- Physical distress: Ref. Table 2.
- Psychological distress: Ref. Table 2.
- Infections: Reported number of episodes the last six months with colds, influenza, inflammation of the throat etc. (0-6).

Table 2. Results from factor analyses of physical and psychological distress. Principal component(s) extracted, factor loadings (regression coeficient) and percent of explained common variance (7367 men and 6832 women).

	Men: Factor	Women: Factor
1. Physical distress:		
- Neck/shoulder pain: Seldom or never=1, once or more a month=2, once or more a week=3, daily=4	.815	.827
- Headache: As for neck/shoulder pain	.710	.739
- Low back pain: For periods more then 4 weeks the last year, no=0 and yes=1	.626	.632
Percent of common variance extracted	52.1	54.3
2. Psychological distress:		
- Reports on depression the last 2 weeks: never or seldom=1, sometimes=2, often=3, most of the time=4)	.792	.866
- Coping problems the last 2 weeks: As for depression	.822	.744
- Plagued with sleeplessness (0,1)	.792	.474
Percent of common variance extracted	52.0	57.3

Table 3.
Results of regression analyses of different levels of health care utilization in men aged 20-61. Tromsø 1986-87.

	LEVELS OF UTILIZATION 1)			
	Equation 1 (n=7369)	Equation 2 (n=6017)	Equation 3 (n=6017)	Equation 4 (n=4609)
Independent variables	Reg. 2) coeff.(t)	Reg. 2) coeff.(t)	Reg. 3) coeff.(t)	Reg. 3) coeff.(t)
Sociodemograpic characteristics:				
Age (years)	-.092(6.6)	-.084(5.4)	-.016(4.6)	.018(5.6)
Level of education(1-5)	-.086(7.3)	-.081(6.1)	-.098(4.0)	.151(5.3)
Rural living area(0,1)	.030(2.7)	.037(2.9)	.196(2.5)	-.176(2.0)
Employment status(1-3)	-.031(2.8)	-.029(2.3)	-.050(.9)	-.115(2.1)
Primary provider: (0,1)	.160(14.9)	.152(12.6)	.692(10.9)	-.047(.7)
Family characteristics:				
Cohabitation(0,1)	.014(1.0)	.015(1.0)	.036(.5)	-
Number in the household (1-8)	-.019(1.5)	-.023(1.7)	-.032(1.4)	-
Children(0,1)	-.024(1.9)	-.025(1.7)	-.076(1.1)	-
Nursing needs in the family (0,1)	-.003(.3)	-.006(.5)	-.298(1.4)	-
Family history of chronic (0-2) disease (0-2)	.019(1.7)	.005(.4)	.018(.4)	-
Health promoting lifestyle indicators:				
Leisure phys. act. (1-4)	.047(4.2)	.037(2.9)	.102(2.8)	-
Alcohol consumption (1-4)	.010(.9)	.015(1.2)	.070(1.8)	-
Smoking (0,1)	-.008(.6)	-.021(1.4)	-.158(2.3)	-
Coffee drinking (1-5)	-.026(2.3)	-.025(1.9)	-.042(1.1)	-
Myocardial infarction RS	.010(.7)	.028(1.8)	.214(2.3)	-
Body Mass Index	.005(.4)	.004(.3)	-.018(.2)	-
Health status:				
Self-rated health (1-4)	-.144(11.7)	-.104(7.6)	-.292(6.4)	-.323(6.5)
Chronic disease (0-2)	.060(5.5)	.053(4.4)	.192(3.5)	.352(6.7)
Physical distress (ref.table)	.162(13.8)	.172(13.2)	.344(10.2)	.042(1.2)
Psychological distress (ref.table)	.089(7.7)	.080(6.3)	.134(4.0)	.040(1.3)
Infections (0-6)	.118(10.7)	.126(10.2)	.194(7.4)	.016(.6)
Total R2	.182	.156		

1): The dependent variable in the various equations:
Equation 1: Number of GP visits in the total material.
Equation 2. Number of GP visits after having excluded individuals with referral services use.
Equation 3. Same as equation 2, but the dependent variable is dichotomous Non-consumers versus one or more visits
Equation 4. Consumers with GP visits only versus referral services users.
2): Multiple regression, standardized coefficients. Log-transformation of number of GP visits
3): Logistic regression.
(t): $p < .05$ if $t > 1.96$, $p < .01$ if $t > 2.576$, $p < .001$ if $t > 3.29$

Table 4.
Results of regression analyses of different levels of health care utilization in women aged 20-56. Tromsø 1986-87.

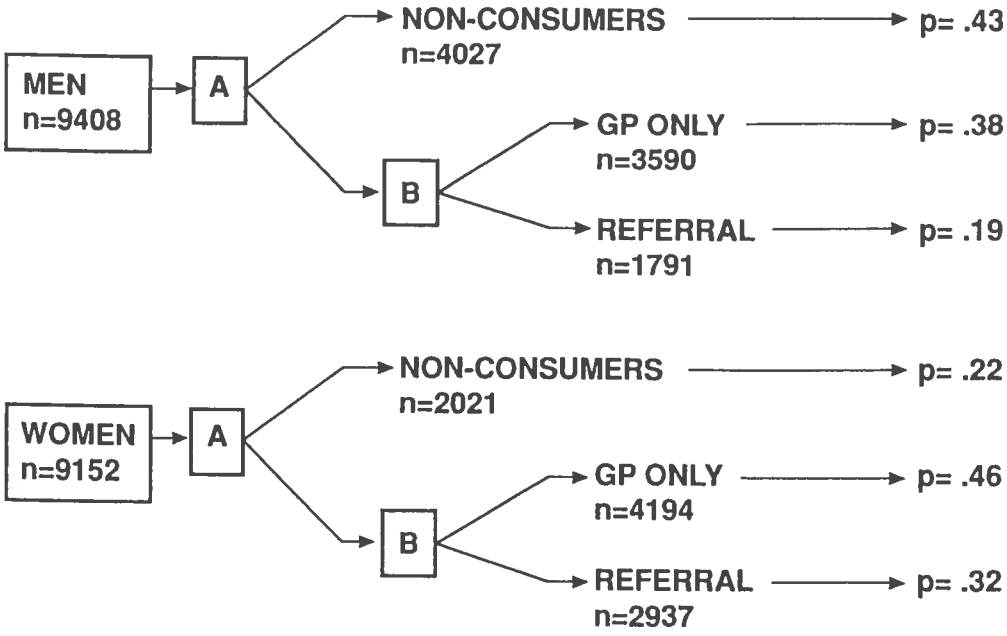
	LEVELS OF UTILIZATION 1) Equation 1 (n=6832)	Equation 2 (n=4577)	Equation 3 (n=4577)	Equation 4 (n=6158)
	Reg. 2) coeff.(t)	Reg. 2) coeff.(t)	Reg. 3) coeff.(t)	Reg. 3) coeff.(t)
Sociodemograpic characteristics:				
Age (years)	-.135(9.4)	-.103(5.8)	-.014(2.7)	.012(3.8)
Level of education(1-5)	-.035(2.9)	-.035(2.3)	-.056(1.1)	.213(8.5)
Rural living area(0,1)	.021(1.9)	.005(.4)	-.108(1.1)	-.222(2.9)
Employment status(1-3)	-.011(.9)	-.013(.9)	-.033(.6)	.013(.3)
Primary provider: (0,1)	.183(16.7)	.158(11.7)	.750(10.8)	.095(1.8)
Family characteristics:				
Cohabitation(0,1)	-.003(.2)	.007(.5)	-.096(1.0)	-
Number in the household (1-8)	-.034(2.6)	-.039(2.4)	-.056(1.8)	-
Children(0,1)	-.037(2.8)	-.042(2.6)	-.233(2.9)	-
Nursing needs in the family (0,1)	.020(1.8)	.014(1.0)	.152(.5)	-
Family history of chronic (0-2) disease (0-2)	.023(2.0)	.039(2.8)	.119(2.1)	-
Health promoting lifestyle indicators:				
Leisure phys. act. (1-4)	.003(.3)	-.009(.6)	-.048(.8)	-
Alcohol consumption (1-4)	.019(1.6)	.032(2.2)	.096(1.8)	-
Smoking (0,1)	-.018(1.3)	-.016(.9)	-.016(.2)	-
Coffee drinking (1-5)	.004(.4)	.010(.7)	-.015(.3)	-
Myocardial infarction RS	.035(2.4)	.034(1.9)	-.082(.6)	-
Body Mass Index	.025(2.2)	.021(1.4)	-.024(.2)	-
Health status:				
Self-rated health (1-4)	-.159(12.3)	-.151(9.7)	-.311(5.1)	-.231(5.5)
Chronic disease (0-2)	.051(4.5)	.039(2.8)	.156(2.7)	.248(5.4)
Physical distress (ref.table)	.174(13.9)	.185(12.1)	.395(8.7)	-.003(.7)
Psychological distress (ref.table)	.067(5.6)	.059(4.1)	.111(2.5)	.019(.1)
Infections (0-6)	.120(10.5)	.123(8.7)	.204(5.9)	-.007(.3)
Total R2	.199	.183		

1): The dependent variable in the various equations:
Equation 1: Number of GP visits in the total material.
Equation 2. Number of GP visits after having excluded individuals with referral services use.
Equation 3. Same as equation 2, but the dependent variable is dichotomous Non-consumers versus one or more visits
Equation 4. Consumers with GP visits only versus referral services users.
2): Multiple regression, standardized coefficients. Log-transformation of number of GP visits
3): Logistic regression.
(t): $p < .05$ if $t > 1.96$, $p < .01$ if $t > 2.576$, $p < .001$ if $t > 3.29$

Legend to the figure.

Figure 1.

The "decision tree" of health care use. Probabilities of use according to level of services in men and women separately.



PAPER IV

DETERMINANTS OF HEALTH CARE UTILIZATION - VISITS AND REFERRALS

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ABSTRACT

This study explores determinants of I)general practitioner (GP) visits, and II)referrals (outpatient and hospitalization). The analyses were performed with regression models on a set of data from a comprehensive population study of 3533 men and 3578 women aged 40-42 in a County in Northern Norway. Among the various health status dimensions included, self-rated health was found to be the most important determinant regardless of type of service. Factors other than health status aspects affecting GP visits were preoccupation with health and help seeking attitude. Volume of resources (GP per population), socio-demographic characteristics and social networks did not appear as important. Several inequitable effects were revealed on referrals: First, increasing referral with increasing educational attainment. Second, high GP/population ratio and residence in municipalities with referral care facilities were both found to be associated with higher probability of referral. The model explaining GP visits predicted more visits among women, while the referral model revealed no sex differences.

Key words: Illness behaviour, health status, health care utilization.

INTRODUCTION

The issue of cost containment continue to dominate the debate regarding strategies for organizing and financing health care services. An issue of particular concern in this regard has been the continuing increase in the consumption of first line services. The concern applies both to the seemingly strong provider influence on utilization, and to an increasing willingness to seek professional help (1). Regarding the latter phenomenon, reports indicate dramatic changes in the population's illness behaviour (2) within few decades. First, observers have noted a historical trend toward broadening of the range of problems and social phenomena that are conceptualized in terms of health and illness (3-4). Second, the threshold for seeking medical care has been lowered (1). A third possible contributing factor, although less firmly documented, is the growing occupation with personal health and healthy lifestyle (3). With reference to the issue of cost containment, these changing patterns of help-seeking behaviour highlight the role of general practitioners as gatekeepers to control the distribution of resources on the various health care sectors.

The literature on the utilization of health services is extensive. According to several reviews, once "illness" measures have been taken into account, organizational, social structural, social networks and attitudinal variables have been inconsistently related to health care utilization (5-8).

Contributing factors of some of the observed contradictions are the varying conceptual and methodological approaches, differing medical care systems and different time periods. Mechanic (7) has reported major discrepancies between the qualitative and the large-scale multivariate studies. The complexity involved in help seeking behaviour and its relation to the various sectors of health care, however, call for variation in analytical approaches (5).

When studying health care utilization in Norway, some particular characteristics of the health care delivery system have to be considered. First, the system is relatively uniform with established rules of referral. Second, financial barriers, on the use of those services considered in present analyses, are not expected to exist. A study of Norwegian data (9), based on the model developed by Andersen et al. (10-11), showed that factors other than those introduced as "need indicators" were of minor importance in explaining variation in visits to the general practitioner during one year. Another study, considering physician visits (both GP and specialists) registered in a 2- week period, indicated variation by social status and geographic distribution of services, the latter exclusively in revisits to the GP and contacts with specialists (12). In a study from a mostly urban population in Northern Norway (13) we analyzed factors influencing GP visits and provider-initiated referral care. The results suggest some important access barriers to health care, interpreted to be primarily related to social status and

individual resources.

The present analyses explore predictors of health care utilization in a middle-aged population in Northern Norway. Two types of health care utilization models are proposed. One is exclusively assumed to explain visits to the general practitioner, and the other to explain factors influencing referrals made by general practitioners. An important theoretical consideration, relevant to both models, has been to make distinctions between the various dimensions of health status (14-15). Further, these are indicators of health and illness on the one hand and socio-demographic, attitudinal and behavioral variation on the other (7). The model on GP visits integrates health status/disease, attitudinal and behavioral, social networks and socio-demographic variables and measures of doctor density/proximity. In addition to health status and disease measures, proximity to referral care services and social structural aspects are assumed to explain decisions involved in referral.

MATERIALS

All residents in the County of Nordland born 1946-48 (aged 40-42) were invited to the first Nordland health study. The screening conducted by the National Health Screening Service started in August 1988 and was finished in June 1989. The screening procedure comprised a questionnaire (questionnaire I) and measurement of blood pressure, weight, height and collection of a non-fasting blood sample. The design and procedures of the screening were similar to the Norwegian County studies and the Tromsø study (16). Questionnaire I, filled in by all attenders, covered own and family history of cardiovascular disease, related symptoms, diabetes, physical activity during leisure and at work, use of salt and type of fat, smoking habits, coffee consumption (type and amount) and social stressors.

All attenders were asked to fill in a second questionnaire (questionnaire II) covering a wide range of topics: various demographic information, chronic diseases (own and family), health and illness, use of health care services during last year, social networks, food and alcohol habits and work environment. Non-responders were given one reminder.

A total number of 4302 men and 4310 women attended the screening, i.e. an attendance rate of 78 % and 86 % in men and women, respectively. Of all attenders 87 % (among both men and women) responded to Questionnaire II. Further details about the design, procedures, description of the population,

attendance and response to questionnaire II are given else where (17).

VARIABLES AND THEORETICAL CONSIDERATIONS

Health care utilization

Our measures are based on self-reported number of visits to the general practitioners (primary care providers) and referral services (specialist contacts, hospitalizations) the year preceding the interview. According to established referral procedures in Norway, it is assumed that individuals who are users of referral level care are restricted to those consulting a GP, and thus the use of these services are principally provider influenced. The following dependent variables were used:

1. Number of GP visits.
2. Any kind of referral services use, coded 1, and nil referral and one or more GP visits coded 0.
3. Hospitalization coded 1, nil hospitalizations and one or more GP visits or specialist consultations coded 0.

Table 1 contains the definitions of the independent variables. We expect the model explaining GP visits to be different from the model of provider-initiated referral services use. The former includes all variables listed in Table 1 except for referral care resources (municipality with hospital).

The referral model includes the various dimensions of health status/disease (except for frequency of infections), sex, educational attainment, the population/GP ratio and two measures on geographical distribution of referral care facilities (urban, municipality with hospital). The "ideal" referral system should reveal the health status measures as the dominant effect variables.

Health personnel and socio-demographic characteristics

Nordland County, with a total population of 240,000 inhabitants, is situated in the northern part of Norway with about half of the area north of the Arctic circle. The organization of the primary health care services is primarily public, with the municipality as the administrative unit. About half of the 45 municipalities of Nordland County have a population of less than 3000 inhabitants, three of them are towns with a total population of 80.000. The average population/GP ratio for the County as a whole is (in 1988) 1363. The intermunicipality variation, however, is rather great. In our material 11.7 % of the individuals lived in municipalities with a population/GP ratio of less than 1000, and another 12.6 % in municipalities with a ratio of more than 2000. Some of the municipalities are experiencing vacancy problems in doctor's positions, and thus the population/GP ratio might not be a valid measure of volume of resources. The measure used in present study was therefore based on information on the number of GP labour years in each

municipality in 1988/89 (Table 1).

The referral care services are located geographically to the 7 municipalities with a hospital, with the highest volume of consultants in the towns. Thus the inclusion of the two geographical variables, "urban" and "municipality with hospital" is assumed to be measures of the geographical distribution of the referral services . In the model explaining GP visits, however, urban is primarily assumed to be an indicator of sociocultural characteristics.

In Norway the employment status per se is assumed to influence the use of GP services. If an employee is absent due to illness more than 3 days, a sickness certification must be submitted to the employee's company. Reasons for being not being employed are many and often related to disease and illness, however, indicating that the interpretation of our variable is not that straight forward. The variable years of schooling is by most researchers studying utilization behaviour assumed to basically measure variation in attitude or inclination to help seeking. In a system with minor financial patient charges, but with queues as an important regulating mechanism, low educational attainment might as well act as an important access barrier. Years of schooling is further seen as one of the most important factors "producing" differences in status attainment.

Social networks/family characteristics

A principal components factor analysis was performed on three items assumed to represent different aspects of social networks other than those related to the family. Table 2 reveals the first component (factor) to extract about 50 % of the common variance in the set of items. Factor scores computed on the basis of the one-dimensional principal components analyses will be used in the statistical analyses. Household size and cohabitation/marriage are assumed to be represent important measures of family networks.

Health attitudes

The three health attitude measures included in the model explaining GP visits are assumed to represent dimensions of particular interest related to illness behaviour. The variable preoccupation with health (Table 1) measure the tendency toward increased attention to health matters in general.

The results of a principal components factor analysis performed on four items assumed to tap other aspects of health attitudes are shown in Table 2. Two principal factors were identified. The first factor was defined by the two items representing locus of control over own health, and the second factor was defined by the two items on health seeking attitude or restraint tc seek medical care.

Health promoting lifestyle

In a previous study we found health promoting lifestyle indicators to be associated with an increased health care consumption (13). The theoretical considerations was based on the idea of a continuum of care, from pure self-care to pure professional care. Self-care, defined as "the range of behaviour undertaken by individuals to promote or restore their health" (18), includes both lay responses to illness and health promoting behaviour as distinct dimensions. Our postulate of positive lifestyle to reduce professional help seeking, based on an assumption of a positive link between the two dimensions of self-care, was thus not supported by the empirical findings (13). A relationship of particular interest in the present model of GP visits is the simultaneous examination of health promoting lifestyle and health attitudinal aspects.

Dimensions of health status and disease

Our central premise is that health is a multidimensional concept. The various chronic diseases included are to be seen as reports on given medical diagnoses. Physical distress is found to be one of the most important factor reducing people's self-rated health (19, 20). We postulated two different aspects of physical distress, physical symptoms as neck/shoulder pain and headache on the one hand, and chest pain and stomachache on the other. Factor scores computed on the basis of the one-dimensional principal components analyses (Table 2) will be used in the statistical analyses. The

measure of less serious transitory morbidities, infections and influenza with high fever, represents an important supplement to the other standard health status variables (21).

STATISTICAL ANALYSES

Multiple regression analyses of number of GP visits were performed separately for each sex. The distribution of number of visits is made less skewed by means of a logarithmic transformation, log(number of visits + 1), and the log-distribution better conforms with the assumption necessary for multiple regression analysis. Standardized values of parameters were estimated, ie. we are not making estimates of the magnitude of the gender effects. Before estimating the effect of all independent variables on GP visits (the full model), three "reduced form" regression analyses were performed in order to reveal the "total" effect of the various independent variables. In the first analysis only health personnel/distance (convenience) and socio-demographic characteristics are included. The second step adds social network variables, and the third one health promoting lifestyle and health attitudes/preoccupation with health. This procedure was based on theoretical considerations regarding the relationship between most of our health status measures and the socio-demographic, attitudinal and behavioral variables. Our "reduced form" estimates thus reveal the

effect of these variables before taking into account the influence of the health status variables.

A logistic regression model was used to estimate the probability of 1)referral (of any kind), and 2)hospitalization. A total number of 135 men and 150 women reported referral services use and nil GP visits. This might either be due to a time-lag of more than one year since actual referral or that direct contacts actually happened. When comparing the "direct" users with the other referral care users they were found to differ on various respects. The analyses were therefore repeated after having excluded the "direct" users of referral care services from the effective material.

A supplementary analysis was performed in order to estimate the independent effect of sex on GP visits. We assumed an interaction effect between gender and household members. When included in the equation as a multiplicative term no statistically significant effect was revealed, and accordingly the term was excluded from the final analysis.

In the sex specific analyses other assumed interaction effects tested were: 1)psychological distress and chronic disease, 3)psychological distress and social network, 4)self-rated health and chronic disease. All these tests for statistical interaction, when included as multiplicative terms in the equations, failed to reach significance.

RESULTS

Table 3 gives the distribution of the various types of health care services according to sex, population/GP ratio and geographical distribution of referral facilities. A total of 62.7 % reported one or more contacts with a GP. Among consumers (individuals with at least one contact with either a GP or referral care) 32.9 % reported referral of any kind, and 12.8 % reported one or more hospitalizations. Women reported higher use of all types of services compared to men, in particular regarding GP visits. Further, Table 3 reveals higher referrals in municipalities hosting the referral care facilities.

Explaining visits to general practitioners

Table 4 and 5 show the zero-order correlations and the results of the multiple regression analyses in men and women, respectively. The zero-order correlations indicate some effect of most categories of variables except for our measures of social networks/family characteristics, with the health status measures showing the highest correlations. When all independent variables were included in the equation, the influence of the health status variables appeared most powerful. This is clearly indicated by the increase in the explained variance, from 6 % to 19.5 % in men and from 6.6 % to 23.2 in women, when the health status measures were introduced as the last block of variables.

Self-rated health appeared as the single variable having the greatest effect on GP visits in either sex. In women none of the health personnel/distance, socio-demographic, social networks and health promoting lifestyle variables were found to have significant effect. The estimates of the same variables in men, Table 4, show a very similar pattern except for a significant negative influence of employment status and smoking. In either sex both preoccupation with health and help seeking attitudes were found to increase use, and the magnitude of the effect appeared about at the same level as most health status measures. A negative effect of high locus of control over health, however, was found in women only.

The supplementary analysis performed to test the effect of sex on GP visits revealed a beta coefficient of .081 (t=6.6), indicating a significant higher use of general practitioners in women.

Factors affecting referral

Table 6 reveals results of the logistic regression analyses of any kind of referral and inpatient, respectively. Regarding the former (both outpatient and inpatient), the estimates indicate some significant inequitable effects. First, increasing referral with increasing GP/population ratio. Second, referral was influenced by geographical distribution of referral facilities, measured by residence in a town and in a municipality with hospital. Third, higher educational groups tended to receive more specialist referral. The

estimated odds ratio between the two most extreme levels of educational attainment was 1.36 (95 % CI: 1.28 - 1.44). The model, however, did not reveal any significant effect of sex. Self-rated health appeared also in this model as the most powerful determinant, with an estimated odds ratio when comparing the two most extreme levels of health (excellent versus poor) of 2.64 (95 % CI: 2.37 - 2.92).

Regarding the model estimates of hospitalization (Table 6), the only variable, except for health status, appearing as a significant determinant was residence in a municipality with hospital. The estimated odds in favour of hospitalization was 1.43 times as large as that for individuals living in other municipalities.

The group of "direct" referral care users were found more likely to be men, to be residents of municipalities with hospital and residents of towns. When the analyses were repeated after exclusion of "direct" users of referral services, some remarkable changes in the estimates appeared: First, the effect of self-rated health increased in both analyses shown in Table 6, ie. the change in odds ratio between the most extremes values increased from 2.64 to 3.16 (all referral) and from 2.64 to 3.69 (inpatient). Second, the effect of urban residence disappeared. Third, a weak but statistically significant effect of gender was revealed on the probability of all referral (estimated odds in favour of referral in women was 1.19 times as large as that for men).

DISCUSSION

In the present study two models have been employed, one assumed to explain GP visits and the other to explain referrals. The model of GP visits revealed health status/disease, preoccupation with health and help seeking attitude as the main determinants. Further, volume of community resources (doctor density), socio-demographic, social networks, locus of control over own health, and health promoting lifestyle variables to have only minor influence. The model on referrals showed that higher educational groups, and those living in municipalities hosting the referral care facilities were more likely to receive referral services. Further, high GP/population ratio was found to increase the probability of referral. While an independent effect of sex was revealed on GP visits, sex was not found to have significant effect on referral.

Self-rated health has consistently been found as an important predictor of the use of various types of health care services (11,13-14, 21-23). These findings are in accordance with present results. The overall judgement made by persons of their own health was the most important determinant of both primary health care and referral services. The strong independent influence on the chance of "breaking through" the referral barrier is worthy of note, in particular since our model includes both measures of chronic disease, physical and psychological distress. This might, however, partly be

explained by the way chronic diseases are handled, by counting all diseases equally as apposed to a grading of seriousness. Although the measure of self-rated health is crude and involves a good deal of measurement error, the relatively strong independent effect on health care use provides further indication that people experience health threats or stressors in a more global manner than traditional medical conceptions would suggest (24). The finding of self-rated health being an independent predictor of survival (25-28) seems to point in the same direction. These results indicate self-rated health to tap dimensions to which other measures or types of appraisals have limited excess, or that health optimism in itself represents a pivotal element both related to illness behaviour and longevity. Subjective health assessments should thus be seen an important tool in health services research trying to penetrate the important issue of health outcomes related to medical care. This suggestion is supported by the finding of an existing gap between conditions reducing self-rated health and our ability to offer these conditions effective treatment through the health care system (19).

Health status should ideally be measured prior to treatment when to be used as an explainer of utilization. It is, however, seldom feasible to measure health status independently of medical treatment. Moreover, in our models some of the most widely used health status measures (in terms of utilization studies) have been omitted, like role limitations and restricted activity days. The replacement of

chronic diseases, physical distress and infections are assumed to fairly well tap the same dimensions (21) and to be less influenced by treatment. The possibility of introducing bias, however, is more evident when retrospective reports on behaviour is collected at the same time as attitudinal data. The ordering of the relationship can obviously be interpreted either way, and it is just as reasonable to conclude that behaviour causes attitudes as that attitudes cause behaviour.

Family and associated networks are assumed to influence illness behaviour or the way individuals interpret and act upon symptoms and stressors (29). The research on the nature of such influences, however, seems in an early stage (5, 30). Freidson's suggestion regarding the importance of a "lay referral system" in the use of medical and social welfare facilities still represents a useful frame of reference (31). In his study of "underutilizers" versus "utilizers", McKinlay (32) found that the "underutilizers" relied on readily available relatives and friends as lay consultants before using health services, while "utilizers" appeared relatively independent of these sources. It has further been reported that networks with a lot of interpersonal contact inhibit help seeking (33). The hypothesized influence of social networks on GP visits was not supported by the present empirical findings. Although covering both frequency of interaction with friends, interaction with neighbours, participation in various religious or other organizations, and family structure, some important aspects of social networks might

have been omitted. In particular geographical proximity to and interaction with relatives, aspects that previously have been found important (31-32). Another explanation of the lacking influence might be that the lay culture and the professional culture is getting more and more alike, paving the way for a more reduced role of lay consultants.

The Norwegian health care system is relatively uniform, with established rules of referral and no financial barriers on the use of the type of services explored in present study. Ideally, our model explaining referral should reveal health status/disease as the dominant determinants. Both reports from Norway and the UK indicate that use of referral services are influenced by the geographic distribution of consultants (12, 34). Present findings revealed the same kind of pattern. The two residential status variables, urban and municipality with hospital, are seen as measures of distance to the nearest facility. Accordingly, our interpretation is that geographical proximity significantly influence decisions of referral made by the GP. Secondly, educational attainment of the individual seems to influence general practitioners referral decisions. This should be considered together with the finding of a slightly opposite trend regarding GP visits. The same pattern was revealed in a previous study from Norway (13), and the findings suggest an existing social status bias among physicians, creating a significant inequitable effect.

Strong evidence of reduced costs of health care systems using

primary care doctors as gatekeepers seems to be lacking (35). In a health care system with no financial access barriers the role of primary care doctors as gatekeepers to monitor referral care is seen as crucial. Although most referral care users in the present study apparently were "true" referral cases, the findings indicate some degree of direct access. Our repeated analyses with the "direct" users excluded from the material revealed significant changes in the model estimates, indicating direct access to increase inequity both related to the geographical distribution of referral care facilities and to "need indicators". Thus, as an implication, more effective incentives in carrying out strict rules of referral seems to be needed in order to reduce inequitable effects, and possibly to reduce unnecessary use of referral care.

The inclusion of the variable "preoccupation with health" was primarily exploratory, assuming that tendency toward increased attention to health matters in general might influence illness behaviour. References are made to the population's growing occupation and fascination with health, the "healthy lifestyle" movement (1, 3). The best determinant of the employed measure appeared to be educational attainment, another being urbanization. The more educated and urbanized, the more occupied with health, and thus the measure apparently disclose patterns combined with "healthy lifestyle". Our measure, however, is plagued with biases already mentioned, and the findings should be interpreted with care. The

mechanisms involved are complex, and future research should consider the suggested phenomenon together with possibly related predispositions. Mechanic (2) has suggested that introspectiveness (attention to self or a tendency to think about oneself, and one's motivations and feelings) as fundamental to understanding illness behaviour. Our findings that high preoccupation reduces self-rated health (20) and, in present analyses, increases health care use, comply well with corresponding findings related to introspectiveness (2).

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Table 1. Independent variables in the model.

Variables and descriptions
Health personnel and distance:
- Population/GP ratio: Based on records on the number of GP labour years in 1988 and 1989 in each municipality, coded < 1000, 1000-1499, 1500+ (1-3)
- Walking distance to GP office (0,1)
- Municipality with hospital: The seven municipalities with hospital=1 (0,1)
Socio-demographic characteristics:
- Sex (men=1, women=2)
- Educational attainment: Years of schooling: < 8, 8-9, 10-12, 13-15, >15 (1-5)
- Urban: The three town municipalities (0,1)
- Employment status: Full-time paid employment (0,1)
Social networks and family characteristics:
- Household size (1-6)
- Cohabitation/marriage (0,1)
- Factor 2: Social networks (Ref. Table 2)
Health promoting lifestyle indicators:
- Leisure physical activity: Sedentary, moderate, keep fit exercise, athletes (1-4).
- Daily smoking: (0,1)
- Total serum cholesterol
Preoccupation with health and health attitudes:
- Preoccupation with health: Talked to family members(0,1) or friends(0,1) about health matters the last two weeks (0-2).
- Factor 1: Locus of control over health (ref. Table 2)
- Factor 2: Help seeking attitude (ref. Table 2)
Health status/disease:
- Self-rated health: In general, how would you say your health is? Poor, fair, good, very good (1-4).
- Physical distress: (Ref. Table 2.) Factor 1: Neck/shoulder and headache Factor 2: Chest pain and gastric pain
- Psychological distress: Depressed during the last 14 days: Never or seldom, sometimes, often, most of the time (1-4)
- Chronic disease: Myocardial infarction, Angina pectoris, Diabetes, Psoriasis, Asthma, Bronchitis, Ulcus of stomach or duodenum, Rheumatoid arthritis, Cancer, Migraine, Epilepsy, Bechterew disease, Eczema: all coded (0,1) and added to an index (0-3)
- Infections: Number of events the last 6 months with colds, influenza, inflammation of the throat etc. (0-4).

Table 2. Results from factor analyses of social networks, health attitudes, and physical distress. Principal component(s) extracted, factor loadings (regression coefficient) and percent of common variance (3533 men and 3578 women).

	Men: Factor	Women: Factor
1. Social networks:		
- Participation (hours per week) in club work/organizations (0-6)	.576	.549
- Number of close neighbours(0-6)	.705	.720
- The frequency of interaction with friends during leisure time(1-5)	.791	.775
Percent of common variance extracted	48.5	47.4

2. Health attitudes:	Factor1	Factor2	Factor1	Factor2
- Tendency to consult a GP when experiencing banal infections/influenza with high fever: Action taken last event:Self-care or GP visit to get a sickness certificate=1, GP visit=2	-.072	.725	.002	.750
- General tendency to consult a GP: "When I am not feeling well, I need to see a doctor": Totally disagree=1, totally agree=4 (1-4)	.062	.744	.162	.714
- Believes has high control over own health: Totally disagree=1, totally agree=4 (1-4)	.795	-.096	.804	-.073
- "If I am getting sick, recovery is mostly dependent of my own behaviour": Totally disagree=1, totally agree=4 (1-4)	.802	.084	.807	-.073
Percent of common variance extracted	32.1	27.4	33.1	27.1

3. Physical symptoms: Neck/shoulder/head	Factor	Factor
- Neck/shoulder pain: Seldom or never=1, once or more a month=2, once or more a week=3, daily=4	.829	.859
- Headache: As for neck/shoulder pain	.829	.859
Percent of common variance extracted	68.7	73.8

4. Physical symptoms: Chest/stomach	Factor	Factor
- Chest pain when walking steps: (0,1)	.746	.765
- Stomachache: (0,1)	.746	.765
Percent of common variance extracted	55.7	58.5

Table 3. Use of general practitioners and referral according to sex, population/GP ratio and geographical distribution of referral facilities. The Nordland health study.

		TYPE OF SERVICES				
		GP visits:			Referral services:	
	n	One or more(%)	Mean	(sd)	Any referral(%)	Hospitali-zation(%)
ALL	7113	62.7	1.70	(2.59)	32.9	12.8
Sex:						
Men	3534	54.8	1.38	(2.48)	30.9	11.4
Women	3579	70.7	2.02	(2.66)	34.4	14.0
Residential:						
Urban	2352	59.2	1.63	(2.57)	35.1	12.3
Other	4761	64.4	1.74	(2.60)	31.8	13.2
Municipality with hospital:						
No hospital	4574	64.3	1.72	(2.53)	30.4	11.8
Hospital	2539	61.3	1.67	(2.68)	37.3	14.9
Population/GP ratio:						
< 1000	1039	66.0	1.82	(2.44)	32.3	14.0
1000-1499	3656	63.1	1.70	(2.52)	33.0	12.5
1500-	2418	60.6	1.65	(2.74)	32.8	13.0

1) One or more referrals (any type) among consumers (at least one GP visit or referral care consultation).
2) One or more hospitalizations among consumers.

Table 4. Results of multiple regression analyses of number of GP visits (log-distribution) in 3533 men aged 40-42. The Nordland health study.

	Corr. coeff.	Step 1 Reg. coeff.	Step 2 Reg. coeff.	Step 3 Reg. coeff.	Full model Reg. coeff.	t
Health personnel and distance:						
Population/GP ratio (1-3)	-.043	-.019	-.023	-.012	-.021	1.1
Walking distance to GP office (0,1)	-.036	-.012	-.013	-.016	.001	.1
Socio-demographic characteristic:						
Educational attainment (1-5)	-.088	-.065	-.064	-.070	-.027	1.6
Town (0,1)	-.044	-.012	-.013	-.020	-.008	.4
Employment status (0,1)	-.121	-.105	-.104	-.103	-.056	3.5
Social networks/family characteristics:						
Factor: Social networks (ref. Table 2)	-.001		-.020	-.029	-.009	.6
Cohabitation/marriage (0,1)	-.028		-.001	-.009	-.002	.1
Household size (1-6)	-.012		-.007	-.007	-.004	.2
Health promoting lifestyle indicators:						
Leisure physical activity(1-4)	-.049			-.038	.015	0.9
Smoking (0,1)	.024			-.001	-.036	2.3
Serum cholesterol	.019			.006	.010	.6
Preoccupation with health and health attitudes:						
Preoccupation with health (0-2)	.097			.124	.080	4.9
Locus of control over health (Table 1)	-.063			-.053	.007	.5
Help seeking attitude (Table 1)	.152			.138	.109	7.0
Health status/disease:						
Self-rated health (1-4)	-.321				-.188	10.6
Physical distress:						
Factor 1: Neck/shoulder and headache	.275				.133	7.9
Factor 2: Chest pain and stomachache	.224				.082	5.0
Psychological distress (1-4)	.190				.073	4.6
Chronic disease (0-3)	.205				.085	5.3
Banal infections	.173				.088	5.6
Total R2		.020	.021	.060	.195	

(t): $p < .05$ if $t > 1.96$, $p < .01$ if $t > 2.576$, $p < .001$ if $t > 3.29$

Table 5. Results of multiple regression analyses of number of GP visits (log-distribution) in 3578 women aged 40-42. The Nordland health study.

	Corr. coeff.	Step 1 Reg. coeff.	Step 2 Reg. coeff.	Step 3 Reg. coeff.	Full model Reg. coeff.	t
Health personnel and distance:						
Population/GP ratio (1-3)	-.038	-.023	-.026	-.011	-.015	.8
Walking distance to GP office (0,1)	-.011	-.001	-.018	-.010	.004	.8
Socio-demographic characteristics:						
Educational attainment(1-5)	-.074	-.065	-.062	-.066	-.021	1.3
Urban (0,1)	-.036	-.012	-.017	-.034	-.012	.5
Employment status (0,1)	-.042	-.022	-.032	-.029	-.001	.1
Social networks/family characteristics:						
Factor: Social networks (ref. Table 2)	-.004		-.021	-.030	-.012	.5
Cohabitation/marriage (0,1)	-.029		-.021	-.030	-.007	.7
Household size (1-6)	-.035		-.038	-.027	-.026	1.5
Health promoting lifestyle indicators:						
Leisure physical activity(1-4)	-.066			-.046	.006	0.3
Smoking (0,1)	.062			-.047	.008	0.6
Serum cholesterol	.024			.001	-.005	.3
Preoccupation with health and health attitudes:						
Preoccupation with health (0-2)	.120			.148	.097	6.3
Locus of control over health (Table 1)	-.119			-.108	-.031	2.1
Help seeking attitude (Table 1)	.143			.135	.109	7.4
Health status/disease:						
Self-rated health (1-4)	-.368				-.193	10.8
Physical distress:						
- Neck/shoulder and headache (Table 2)	.316				.133	7.9
- Chest pain and stomachache (Table 2)	.279				.124	7.7
Psychological distress (1-4)	.218				.078	4.9
Chronic disease (0-3)	.231				.086	5.5
Banal infections	.192				.076	5.0
Total R2		.007	.010	.066	.232	

t: $p < .05$ if $t > 1.96$, $p < .01$ if $t > 2.576$, $p < .001$ if $t > 3.29$

Table 6. Results of logistic regression analyses of referral services use in 4457 men and women aged 40-42. The Nordland health study.

	ALL REFERRAL 1) Reg. coeff.	t	HOSPITAL 2) Reg. coeff.	t
Volume and geographical distribution of resources:				
Population/GP ratio (1-3)	-.156	2.5	-.110	1.0
Municipality with hospital (0,1)	.315	4.4	.359	3.3
Urban (0,1)	.215	2.4	-.030	.2
Socio-demographic characteristics:				
Sex (men=0, women=1)	.132	1.9	.164	1.7
Educational attainment (1-5)	.077	2.5	-.005	.1
Health status/disease:				
Self-rated health (1-4)	-.323	6.0	-.339	4.6
Physical distress:				
- Neck/shoulder and headache (Table 2)	-.015	.4	-.011	.2
- Chest pain and stomachache (Table 2)	.068	2.2	-.000	.0
Psychological distress (1-4)	.115	2.3	.175	2.7
Chronic disease (0-3)	.151	4.3	.096	2.0

1) Consumers with nil referral services use versus referral services consumers (0,1).
2) One or more hospitalizations=1, consumers with nil hospitalizations=0.

t: $p < .05$ if $t > 1.96$, $p < .01$ if $t > 2.576$, $p < .001$ if $t > 3.29$

PAPER V

HEALTH STATUS AND GENERAL PRACTITIONER VISITS

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ABSTRACTS

The present paper explores the influence of health status aspects, socio-structural and attitudinal/behavioral factors on use of primary health care services (GP visits) by means of a proposed model specifying the links between employed variables. Data were derived from a comprehensive health survey of the population of Finnmark County, Norway in 1987-88, including 4549 men and 4360 women aged 30-62. The Lisrel system was employed to estimate the statistical relationship between the model variables. Self-rated health appeared as the central variable influencing GP visits, both by having the greatest direct effect and by playing an important role as a transmitter of the indirect effects of prior variables, in particular physical distress and disablement benefit. Preoccupation with health was found to independently increase visits, an effect similar in magnitude to physical distress, chronic disease and psychological distress. Disability pensioning appeared in either sex to be the most important factor reducing self-rated health, while in men disability pensioning turned out to have a strong and negative direct effect on use. The analyses suggest the impact of social status, indicated by educational attainment, to operate significantly through other factors and particularly through disability pensioning.

Key words: Health care utilization, self-rated health, health status, illness behaviour.

INTRODUCTION

How to conceptualize and measure health status represent issues of crucial importance in much health services research. The multidimensional model of health status implies that the selection of health status measures should be based on considerations about dimensions of particular concern for the purpose of the study (1, 2). One of the most frequent applications of health status measures has been in the study of illness behaviour (3), through epidemiological studies employing multivariate models analyzing use of health care services. The various models of health care utilization differ considerably in conceptualization and operationalization of health status (4-5), and even when different researchers are employing the same model striking inconsistencies appear in operationalization (5-9). An illustrative example is Andersen's "need for care", originally suggested to include both measures of perceived illness and some kind of professional judgement (6, 10). Some of the proposed measures are often not practical - or exceedingly expensive - to "operate", an obstacle that seemingly fosters the diversity in the way "need" is measured. Pope examined the four commonly used health status indicators (self-rated health, role limitations, functional limitations and restricted activity days) with regard to underlying medical conditions (11). The type of conditions reflected by these measures were found to be similar and tended to be chronic and severe, suggesting these indicators to be incomplete measures when studying whether health care services are used according to need or not (11).

The complex pattern of illness and disease, however, can not be expected fully captured by a few health status measures. Nevertheless, operationalization through a multidimensional model of health might be useful in order to explore factors influencing the use of health care services. The main focus of the present paper makes reference to the consistent finding of self-rated health being one of the best predictors of use of health care services (2, 11-16) and to be an independent predictor of survival (17-20). In a previous paper a causal model (structural equation model) to explore mechanisms involved in global self-evaluation of health (21) was suggested. The model integrated various measures of health status - conceptualized as distinct dimensions - by specifying the linkages between somatic, psychological and physiological measures, and social-structural and attitudinal/behavioral factors. Data in this study, as well as the present study, originated from a population study including individuals aged 30-62 years in Finnmark County, Norway. The findings suggested physical distress, measured as symptoms of pain from various parts of the body, and the work disablement role (disablement benefit recipient) to play the key role in reducing self-evaluated health. The modest effect of chronic disease contrasted the seemingly strong labelling impact of permanent work disability. Furthermore, the impact of most of the factors affecting self-evaluation of health was found to be strongly socially patterned. The results indicated that an important dimension reflected by global self-evaluated health is the

overall interpretation of own suffice in general, of how people handle the various stressors and the "pain in life". In the present study this model has been adopted in order to explore primary care provider visits.

MATERIAL

The data stem from the Finnmark County Health Survey conducted by the National Health Screening Service from May 1987 to June 1988. The following population groups were invited: All residents aged 40-62, all residents aged 30-39 invited to a similar survey in 1977 (10 per cent random sample) and a 10 per cent random sample of the persons aged 20-39 not invited to the survey in 1977.

The main components of the survey were 1)measurements of weight, height, blood pressure and serum lipids and 2)three self-administered questionnaires. Given high non-attendance in age-group 20-29, however, the decision was made to exclude this age-group from the analyses, which after excluding cases with missing data were based on a total of 4549 men and 4360 women. A description of the survey is given elsewhere (21)

VARIABLES AND MODEL SPECIFICATION

An important premise regarding the suggested model on self-rated health has been the multidimensional concept of health and that health and illness evaluations are made relative to capacity for role and task performance. The theoretical considerations and the rationale behind suggested specifications of the model on self-evaluation of health have previously been presented (21). Table 1 presents the definitions of the variables entering the model. Number of visits to the general practitioner (GP) the year preceding the interview (y8) is the ultimate dependent variable. It should be noted that visits to industrial physicians, assumed to be primarily linked to preventive health care practices, are not included. The assumption made is that the decision to seek the GP is primarily made by the individual alone or after lay consultation.

Some important characteristics of the professional health care system of Finnmark County should be noted. The system is relatively uniform with the organization of services almost exclusively public, and with no factual financial access barriers on the use of services. Furthermore, GP's are assumed to be the primary care providers acting as "gatekeepers" to referral care services. The 1987 official statistics on the population/GP ratio (GP measured as number of GP labour years) revealed the availability of GP services in Finnmark to be relatively high (a ratio of 1012 in Finnmark compared to a national average of 1390). Further, comparison of population/GP

ratio at the municipality level revealed only minor variation.

The suggested model is illustrated in Figure 1. All jointly dependent variables (the y-variables or endogenous variables) are assumed to be directly affected by all the independent variables (x-variables or exogenous variables). The direct effects of each independent variable on all the 8 jointly dependent variables (gamas) are for simplicity reasons illustrated by single arrows. As shown in Figure 1, only three effects of y-variables on other y-variables (betas) are fixed at zero, the effect between chronic disease (y1) and myocardial infarction risk score (y3), the effect of y3 on physical distress (y4) and the effect of y2 (psychological distress) on y6 (preoccupation with health).

All included variables are thus assumed to directly affect use of services. It should be noted that the variable chronic disease (y1) is included as counts of diseases (Table 1). Moreover, they are not seen as reported physical symptoms, but rather medical diagnoses. The rationale of the specification of a direct effect of myocardial infarction risk score (y3) on GP visits is the strong focus on cardiovascular risk factors, in particular cholesterol levels, the last 10-15 years. Ten years ago high risk individuals in our study population were informed about their risk profile and given health education, basically related to dietary habits, smoking and physical activity (high risk strategy).

Educational attainment (x3) is seen as one of the most important factors producing differences in status attainment, and has been included as an indicator of social status. Fear of losing employment (x4) is assumed to measure the burden of economical and social insecurity due to ongoing structural changes in the society. Finnmark County had been facing economical depression for some few years prior to the survey, explaining the high proportion of the population reporting fear of losing employment (16.8 % and 10.1 % in men and women respectively). The same mechanisms might partly explain the high proportion of disablement benefit (disability pensioning) (y5) found in present material (13.2 % in men and 19.4 % in women), indicating that disability pensioning might have been offered as an alternative to unemployment benefit.

The included measure of level of preoccupation with health has been found to tap dimensions that conform well with characteristics of the "positive lifestyle movement" (21, 22); being positively influenced by years of schooling, physical activity and urban living area. It has further been found to be an important determinant of GP visits (14).

ANALYSIS OF THE DATA

Polychoric or polyserial correlation coefficients are recommended when variables are all ordinal or of mixed scale

types (23-24). Based on the polychoric and polyserial correlation matrix of the model variables, sex specific standardized regression coefficients were estimated by employing the Lisrel system (Lisrel VI within SPSS-X) (23-24). We assume the disturbance terms to be unrelated to each other and to the x-variables. The estimates were found to be unaffected by the estimation method, ie. unweighted least squares compared to maximum likelihood. Both sex specific zero-order correlations and estimates of direct and total effects are given. The total effect is the sum of direct and indirect effects and reflect the change in a variable that is induced by a given unit (here standard deviation) change in an prior variable of the given model, regardless of the particular intervening mechanisms through which these changes occur (25). The direct effect of a variable is the independent effect or the remaining effect when all other variables are being held constant. Indirect effects are components of the total effect of a variable that are mediated by variables specified by the model as intervening between the causal variable and the dependent variable of interest.

RESULTS

Table 2 gives per cent non-utilizers and mean (and standard deviation) GP visits last year according to sex, age-group and self-rated health. Women reported higher utilization compared to men, on average .55 more GP visits. The variation according to age was rather small, with the slight hammock shaped distribution of mean number of GP visits appearing in men. In women a somewhat higher use appeared among the youngest age-group. When comparing individuals judging their health to be poor versus excellent, the mean number of GP visits increased 6.3 and 4.2 times in men and women respectively.

As shown in Table 3 the strongest zero-order correlations between GP visits and other variables were with other dependent variables except for myocardial infarction risk score. Among the independent variables, the size of the correlations were in general rather modest, and social networks displayed no relationship with use in either sex.

Estimates of direct and total effects of the model variables are presented in Table 4 (men) and Table 5 (women). The chi square distribution was used to assess the extent to which the proposed model fitted the data. With 3 degrees of freedom, the probability was greater than .05 in men, indicating an acceptable fit, ie. effects fixed at zero, are supported. As previously reported (21), the restriction of an effect of myocardial infarction risk score on physical distress had to be

removed in women and, as seen from Table 5, an acceptable fit was reached with 2 degrees of freedom.

With the exception of myocardial infarction risk score, GP visits were both directly, as well as indirectly, influenced by all the introduced dependent variables. In both sexes chronic disease, psychological distress, physical distress and self-rated health had the largest total effect on use of services. Self-rated health was found to have the strongest direct effect on use (.287 and .210 in men and women respectively). In men, however, the direct effect of disablement benefit appeared negative and comparable in magnitude (-.289), whereas in women this effect was not statistically significant (-.039). While the independent effect of disablement benefit strongly reduced the use of services in men, it substantially increased use indirectly through self-rated health. This indirect effect through self-rated health was estimated to be .167 in men and .108 in women.

As seen from Tables 4 and 5 the directs effect of chronic disease, psychological distress, physical distress and preoccupation with health were all substantial in magnitude, and with an important part of the effects of the various variables operating indirectly via subsequent variables. In particular the negative indirect effect of both physical distress, psychological distress and chronic disease through disablement benefit appearing in men, and in either sex the positive indirect effect of physical distress mediated through self-rated

health.

The effect of either leisure physical activity and social networks on use was not supported by the empirical findings in either sex. Apart from a negative effect of urban living area on GP visits, the role of the other independent variables appeared somewhat different in men and women. The estimated direct effect of age was negative (-.110) in women and positive - although low in magnitude - in men.

The importance of considering both direct and indirect effects are clearly demonstrated when interpreting the effect of years of schooling on GP visits. While the estimated total effect was modest and negative in both sexes, the direct effect appeared not statistically significant in women. In men, however, the corresponding direct effect was estimated to -.136. In this regard both disablement benefit, self-rated health and preoccupation with health play an important role as transmitters of effects; in men as a positive effect of educational attainment through disablement benefit (.105) and likewise - in both sexes - through preoccupation with health (.030 in men and .028 in women). Finally, educational attainment was found to indirectly affect use through both disablement benefit and self-rated health (-.064 and -.040 i men and women respectively).

The independent effect of fear of unemployment on use of services was in men found to be negative (-.131) and in women positive (.043). An influence of fear of unemployment on use is

transmitted through self-rated health (.073 and .035 in men and women respectively). Furthermore, in men a positive impact is mediated via disablement benefit (.134).

DISCUSSION

A causal model on visits to the general practitioner was suggested, integrating various aspects of health status, socio-structural and attitudinal/behavioral factors. The notion of causality is here conceptualized in terms of simplifying models (26). In social non-experimental research, when a presumed causal variable can not be manipulated, the model can be established by relying on theoretical arguments about the temporal sequence of variables (23, 26). The model adopted here represents an approximation of a more complex model, and several of the inherent simplifying assumptions have been discussed elsewhere (21). It should be noted that the model can be elaborated further by including additional variables assumed to be important, and the literature suggests a variety of such variables to be considered. For instance the inclusion of measures on availability of health care resources would have been of particular importance when trying to assess aspects related to equity in access to health care. Several previous Norwegian studies have employed multivariate models integrating both "need for care" variables and availability measures (GP/population ratio and geographical proximity of facilities). The results indicate, however, such factors exclusively to influence the use of referral care services (13-14, 27).

Some points may be made about possible biases linked to the present way of measuring utilization. It is, in the first place, the possibility of memory bias when people are asked to

recall use the year preceding the interview. Previous reports suggest a substantial under-reporting (28), and it has been found that those with frequent visits, females, older people and those with serious medical conditions tend to report more accurately (4). Although difficult to evaluate, attempts to do so indicate this bias not to represent a serious threat to the present types of analyses (13). A second methodological issue is related to the fact that the employed measure of utilization includes various types of visits (except for some particular preventive type of contacts as previously mentioned). Previous reports suggest preventive visits to represent a different response - or not to be influenced by the same factors - compared to strictly illness related visits (5). Available information from Norway, however, indicate that only a marginal proportion of the measured GP visits are strictly preventive (29, 30). The assumption made in the present study was that the decision to visit the GP is primarily made by the individual alone or after lay consultation. Although the information from Norway on this issue appears somewhat incomplete, providers seem obviously to have some influence on GP visits. A great deal of regional variation and differences due to variation in practice-style is expected (27), and reports seems to indicate that the influence of providers will increase with increasing availability of primary care providers (29). The component of provider influence, however, might not be feasible to sort out using present type of data design. Further research is needed in order to fully illuminate the complex decision processes involved.

The literature presents some useful information regarding the question of how well the present model reflects the individual "need for care". Various reports indicate that some particular conditions might not be adequately reflected (11, 13-14). The apparently most important example in this regard seems to be the transitory type of conditions, which may result in substantial utilization. In two previous studies employing a model where transitory morbidities (reported episodes with colds, influenza, inflammation of the throat etc.) were included together with most of the present health status measures, such transitory morbidities appeared as independent determinants of GP visits (13-14). An analysis performed after having excluded this variable, however, did not reveal any substantial change in the estimates of effects of the other variables on visits. Similar examples of factors or conditions not reflected by present health status measures are according to Pope (11) those related to pregnancy and various disorders where "medical intervention is most effective", for example simple curable cancers and disorders of the eye.

The present finding of self-rated health having a strong independent impact on use is in accordance with previous studies showing this measure to be an important determinant of both GP visits and referral care services (2, 11-16). Compared to results both from other Norwegian studies and from the U.S., however, the direct influence of self-rated health appeared surprisingly large when seen relative to the direct influence of

some other health status measures, in particular physical distress (12-14). This might suggest the present study to some extent to overestimate the direct influence of self-evaluated health, and the use of a relatively narrow physical distress measure (for instance by not assessing frequency of particular symptoms) as a seemingly important explanation.
A further note with regard to the role of self-perceived health has to do with the plausibility of assuming only one way effect, suggesting a more realistic assumption to be a reciprocal relationship. It is reasonable to expect, as suggested by Kaplan et al. that an individual's self-evaluation of health is changed when "involved in activities concerning the state of own health" (19). With particular relevance to the importance of evaluating medical care experiences, this issue warrant thorough future research attention.

Preoccupation with health (when measured in the same way as in the present study) does independently increase GP visits (14). The present analyses support this result, and some striking linkages to other model variables were revealed throwing light on possible mechanisms involved. Most striking in this regard is the finding that preoccupation with health strongly increases with educational attainment and - somewhat less strongly - with leisure physical activity and urban living area. Moreover, the revealed negative independent effect of preoccupation with health on self-rated health, statistically significant only in men, merits attention in this regard. Although alternative interpretations seem relevant (14), the findings might be

interpreted as negative side effects related to the growing occupation and fascination with personal health (22), and thus a more thorough exploration is urged.

The present empirical data are consistent with previous Norwegian studies demonstrating social inequalities in health (31, 32). Particular attention in this regard should be paid to the high proportion of disability pensioning in the population studied and the revealed strong independent influence of educational attainment on the chance of receiving disablement benefit. In Norway the rapid increase in disability pensioning the last two decades, often referred to as a paradox of the welfare state, is regarded as a primary social problem (33). A premise frequently adopted, studying the increasing disability pensioning, has been to see the phenomenon as primarily resulting from socio-structural mechanisms, for instance labour market changes leading to the exclusion of the less qualified from work opportunities (34). As an alternative to unemployment those "put away" from the labour market might "choose" disability pensioning, a practice or strategy handled by the bureaucracies through the prescription of medical diagnoses and using doctors as "gatekeepers". A kind of medicalization of unemployment has thus been introduced. In this context the strong labelling impact of disability pensioning on self-rated health in either sex represents a finding of particular concern. The suggestion put forward in a previous paper was that the work disablement role sets off a specific process of coping (21). Besides an expected negative impact of permanently being

deprived employment (35-36), stressing the sick role might act as a rational strategy to legitimate the work disablement role (37). Particularly the latter explanation should be indicative of the work disability role per se to boost professional help-seeking. Thus the present finding of a strong negative independent influence of disablement benefit in men and barely no such influence in women, seems somewhat puzzling. Although disability pensioning positively affect use indirectly through self-rated health in both men and women, the independent influence is interpreted as a marked "underutilization" among men. At least one explanation may be worth considering. It is that the "underutilization" reflects the "pensioners" previous learning concerning doctors limited capability to offer them effective treatment. According to reports (Norwegian official statistics) on diagnoses used as cause for disability pensioning, mental problems and illness in the muscle and skeleton system account for more than 50 per cent (32). These are among the kind of conditions where the ability of the health care system to offer effective treatment most often is rather restricted.

In conclusion, self-rated health appeared as the principal variable influencing GP visits, confirming the results of others showing this measure to reflect particular subjective need and elucidating the significance of "paying attention" to what people say about their health. The finding of preoccupation with health to independently increase use indicates "intervention" aiming at high preoccupation with personal health

in the population not to be a viable method hampering the increasing health care utilization. Finally, the results have shown most health status aspects to be socially patterned, and of particular concern in this context is the strong social selection mechanisms and negative health effects related to disability pensioning. Further research is strongly advocated.

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Table 1. Independent and dependent variables in the model.

Variables	Descriptions
x1	**Age**: In years (30-62).
x2	**Urban**: Population of the municipality (1-3): less then 2000, 2000-, 4000-14000.
x3	**Years of schooling**.
x4	**Fear of losing employment**: Risk the coming years due to closing down, reductions or other reasons, No,yes(0,1): Yes statet by 16.8 % (men) and 10.1 % (women).
x5	**Leisure physical activities**: Sedentary, moderate, keep fit exercise, athletes (1-4).
x6	**Social networks**: Exchange services with neighbours, index(0-8)
y1	**Chronic disease**: Myocardial infarction, Angina pectoris, Diabetes, Psoriasis, Asthma, Bronchitis, Ulcus of stomach or duodenum, Rheumatoid arthritis, Cancer and Migraine, epilepsy: all coded (0,1) and added to an index (0-5).
y2	**Psychological distress**: Index (0-2) based on depression (0,1) and sleeplessness(0,1).
y3	**Myocardial Infarction Risk Score**: Based on the following three variables (apart from sex): Serum cholesterol, systolic blood pressure and number of cigarettes currently smoked per day.(For calculation, see reference (23)
y4	**Physical distress**(pain): Low back pain, Chest pain when walking steps, Pain from upper part of stomach, heartburn, Pain from joints: all coded (0,1) and added to an index (0-5).
y5	**Disablement benefit** (DB, 0-2): 1=receive DB and had a part-time job last year, 2=receive DB and no paid employment last year (full or partiel permanent work disability reported by a total of 13.2 % and 19.4 % in men and women respectively).
y6	**Preoccupation with health**: Talked to family members(0,1) or friends(0,1) about health matters the last two weeks (0-2).
y7	**Self-rated health**: In general, how would you say your health is? Poor, fair, good, very good (1-4).
y8	**GP visits**: Number of visits to the general practitioner the year preceding the interview (0-9).

Table 2. Per cent non-users and mean number of general practitioner visits (sd) according to sex and age and according to self-rated healthself-rated health.

	MEN:				WOMEN			
			GP visits				GP visits	
	n	Non-users(%)	x	sd	n	Non-users(%)	x	sd
Total	5332	45.6	1.58	3.04	5189	32.4	2.13	2.69
Age								
30-34	259	43.6	1.80	6.46	290	24.1	2.36	2.61
35-39	501	49.3	1.44	2.40	505	30.9	2.01	2.68
40-44	1254	46.4	1.43	2.40	1137	29.8	2.16	2.81
45-49	943	50.6	1.31	2.26	875	31.3	2.09	2.65
50-54	825	46.1	1.61	2.41	825	31.5	2.12	2.54
55-59	961	41.3	1.92	4.04	965	37.9	2.13	2.67
60-62	589	40.2	1.73	2.14	592	36.8	2.09	2.79
Self-rated health								
Poor	190	22.6	4.38	8.04	190	26.3	4.33	4.49
Fair	1096	31.4	2.59	4.17	1225	21.6	3.23	3.27
Good	3070	46.5	1.32	2.01	2939	32.7	1.83	2.24
Excellent	976	63.4	.69	1.49	835	48.9	1.04	1.63

Table 3. Simple correlations[1] between variables entering the model for 4658 men(below the diagonal) and 4308 women (above the diagonal).

Variable	Correlation with (x1)	(x2)	(x3)	(x4)	(x5)	(x6)	(y1)	(y2)	(y3)	(y4)	(y5)	(y6)	(y7)	(y8)
								FEMALES						
Age (x1)	-	-.011	-.437	-.116	.014	-.238	.125	.135	.434	.156	.519	-.038	-.259	-.007
Urban (x2)	-.043	-	.163	-.198	-.013	-.042	-.036	-.026	-.059	-.029	-.002	.067	.035	-.049
Years of schooling (x3)	-.397	.193	-	-.107	.043	.194	-.126	-.123	-.311	-.179	-.519	.180	.301	-.067
Fear of losing employment (x4)	-.073	-.188	-.198	-	.007	.077	.031	.097	.005	.002	-.341	.055	-.004	.069
Leisure physical activity (x5)	-.066	.039	.104	-.081	-	.098	-.058	-.081	-.050	-.080	-.119	.049	.202	-.076
Social networks (x6)	-.196	-.000	.156	.062	.118	-	-.017	-.091	-.093	-.051	-.254	.245	.155	.014
Chronic disease (y1)	.210	-.043	-.158	.037	-.096	-.056	-	.259	.051	.412	.372	.047	-.374	.238
Psychological distress (y2)	.026	-.007	-.060	.151	-.092	-.066	.271	-	.092	.416	.369	.051	-.447	.274
MI Risk Score (y3)	.232	-.078	-.197	.034	-.141	-.056	.055	.064	-	.114	.249	-.065	-.186	.020
Physical distress(pain) (y4)	.117	-.048	-.210	.152	-.081	-.007	.423	.394	.059	-	.424	.121	-.569	.332
Disablement benefit (y5)	.521	-.124	-.485	-.321	-.084	-.196	.454	.335	.151	.408	-	-.033	-.608	.206
Preoccupation with health (y6)	.023	.105	.158	.011	.073	.189	.079	.046	-.044	.113	.001	-	-.051	.156
Self-rated health (y7)	-.248	.078	.277	-.116	.237	.117	-.405	-.403	-.177	-.537	-.570	-.082	-	-.356
GP visits	.070	-.093	-.120	.088	-.069	-.006	.267	.245	.036	.334	.187	.158	-.360	-
						MALES								

[1] Polychoric (when a pair of variables are ordinal) and polyserial (one ordinal and the other continuous) correlation coefficients are estimated when the ordinal variable in a pair of variables have number of values less or equal to 8.

Table 4. Estimates of direct effects and total effects (in italic) of the model in 4549 men. Standardized solution.

Var.	Variables x1	x2	x3	x4	x5	x6	y1	y2	y3	y4	y5	y6	y7	R^2
y1	.178	-.013*	-.071	.028*	-.074	-.003*								.058
	-	-	-	-	-	-								
y2	-.030*	.046	.006*	.148	-.051	-.061	.266							.102
	.017	*.042*	*-.013*	*.156*	*-.071*	*-.062*	*.266*							
y3	.183	-.046	-.103	.001*	-.113	.012*	-	.043						.084
	.183	*-.044*	*-.104*	*.008*	*-.116*	*.009*	*.012*	*.043*						
y4	.002*	-.003*	-.135	.066	-.010*	.048	.322	.291	-					.290
	.064	*-.011*	*-.162*	*.121*	*-.054*	*.029*	*.399*	*.291*						
y5	.264	-.116	-.362	-.465	.004*	-.030	.208	.248	-.015*	.181				.732
	.315	*-.106*	*-.408*	*-.399*	*-.045*	*-.041*	*.346*	*.300*	*-.015*	*.181*				
y6	.106	.095	.225	.084	.054	.180	.031	-	-.022*	.101	.078			.101
	.139	*.088*	*.177*	*.065*	*.045*	*.179*	*.099*	*.052*	*-.023*	*.116*	*.078*			
y7	.061	-.039	-.114	-.255	.150	.026	-.017*	-.044	-.081	-.231	-.617	-.047		.535
	-.167	*.016*	*.165*	*-.079*	*.197*	*.040*	*-.340*	*-.302*	*-.070*	*-.348*	*-.621*	*-.047*		
y8	.033	-.108	-.136	-.131	.010*	-.002*	.144	.134	-.028	.154	-.289	.131	-.287	.210
	.041	*-.064*	*-.076*	*.058*	*-.053*	*.017*	*.251*	*.185*	*-.006*	*.217*	*-.101*	*.145*	*-.287*	

- Total coefficient of determination for structural equations= .758
- Chi-square with 3 degrees of freedom=4.60, probability=0.204
- Direct effects: All estimates are standardized and are significant at the .05 level except those marked by *

x1: Age
x2: Urban
x3: Years of schooling
x4: Fear of loosing employment
x5: Leisure physical activity
x6: Social networks

y1: Chronic disease
y2: Psychological distress
y3: MI Risk Score
y4: Physical distress (pain)
y5: Disablement benefit
y6: Preoccupation with health
y7: Self-rated health
y8: GP visits

Table 5. Estimates of direct effects and total effects (in italic) of the model in 4360 women. Standardized solution.

Variables Var.	x1	x2	x3	x4	x5	x6	y1	y2	y3	y4	y5	y6	y7	R^2
y1	.101	-.016*	-.078	.029*	-.059	.025*								.027
	-	-	-	-	-	-								
y2	.091	.002*	-.028*	.104	-.062	-.062	.236							.098
	.115	*.002*	*-.047*	*.111*	*-.076*	*-.056*	*.236*							
y3	.381	.026*	-.139	.026*	-.051	.029	-	.019*						.211
	.383	*-.025*	*-.139*	*.028*	*-.053*	*.027*	*.005*	*.019*						
y4	.020*	-.003*	-.088	-.048	-.032	.015*	.313	.322	.032					.287
	.100	*-.008*	*-.132*	*-.002*	*-.077*	*.005*	*.390*	*.322*	*.032*					
y5	.232	-.001*	-.373	-.375	-.059	-.064	.188	.209	-.021	.152				.671
	.282	*-.004*	*-.414*	*-.348*	*-.096*	*-.070*	*.296*	*.257*	*-.016*	*.152*				
y6	.071	.066	.240	.127	.036	.239	-.025*	-	-.034	.131	.125			.124
	.104	*.065*	*.177*	*.081*	*.017*	*.230*	*.062*	*.074*	*-.032*	*.150*	*.125*			
y7	.054	-.002*	-.049	-.168	.105	.025	-.032	-.108	-.045	-.294	-.513	-.019*		.546
	-.155	*.003*	*.212*	*-.005*	*.189*	*.059*	*-.325*	*-.337*	*-.046*	*-.374*	*-.515*	*-.019*		
y8	-.110	-.033	-.002*	.043	-.013*	.015*	.073	.098	-.003*	.127	-.039*	.115	-.210	.194
	-.024	*-.028*	*-.069*	*.052*	*-.076*	*.023*	*.232*	*.228*	*-.006*	*.229*	*.162*	*.119*	*-.210*	

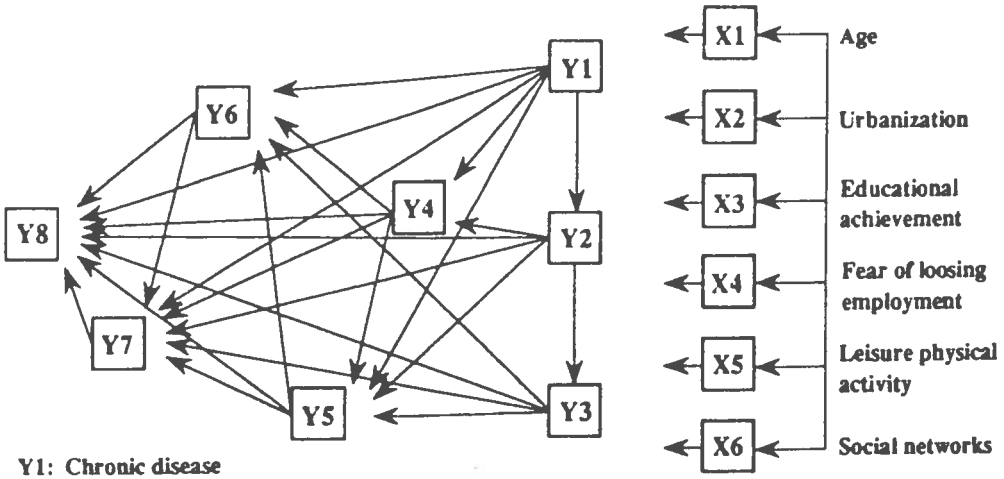
- Total coefficient of determination for structural equations= .713
- Chi-square with 2 degree of freedom=3.38, probability=0.184
- Direct effects: All estimates are standardized and are significant at the .05 level except those marked by *

x1: Age
x2: Urban
x3: Years of schooling
x4: Fear of loosing employment
x5: Leisure physical activity
x6: Social networks

y1: Chronic disease
y2: Psychological distress
y3: MI Risk Score
y4: Physical distress (pain)
y5: Disablement benefit
y6: Preoccupation with health
y7: Self-rated health
y8: GP visits

Legend to figure

Figure 1. The suggested model.



Y1: Chronic disease
Y2: Psychological distress
Y3: MI Risk Score
Y4: Physical distress
Y5: Disablement benefit
Y6: Preoccupation with health
Y7: Self-rated health
Y8: No. of GP visits

ISM SKRIFTSERIE – FØR UTGITT:

1. Bidrag til belysning av medisinske og sosiale forhold i Finnmark fylke, med særlig vekt på forholdene blant finskættede i Sør-Varanger kommune.
   Av Anders Forsdahl, 1976. (nytt opplag 1990)

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   Av Anders Forsdahl, 1977.

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4. The Tromsø Heart Study: Population studies of coronary risk factors with special emphasis on high density lipoprotein and the family occurrence of myocardial infarction.
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De som er merket med * har vi dessverre ikke flere eksemplar av.